

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** PLATINUM, SOLUBLE SALTS AS PT ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

The basic text of this document contains the draft technical standard approved by the Joint Review Committee of the NIOSH/OSHA Standards Completion Program and the supporting documentation for the substance PLATINUM, SOLUBLE SALTS AS PT.

The SCP draft technical standards are recommendations to the Department of Labor for its consideration in rulemaking and have no legal status until final rules have been promulgated by that agency. This draft standard is provided for your information only.

The References and Sources, Respirator Table Documentation and Use/Exposure and Control Documentation are the working documents used by the various SCP working groups during the development of the draft technical standard and serve as the technical foundation for the standard. The classification for each substance and the regulatory statements were derived following a decision logic established for the various sections of the standard.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

(a) Definitions. (1) "Permissible exposure" means exposure of employees to airborne concentrations of soluble platinum salts not in excess of 0.002 milligrams per cubic meter (mg/M3), averaged over an eight-hour work shift (time weighted average), as stated in § 1910.1000, Table Z-1.

(2) "Action level" means one half of the permissible exposure for soluble platinum salts.

(b) Exposure determination and measurement. (1) Each employer who has a place of employment in which soluble platinum salts is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of soluble platinum salts at or above the action level. The determination shall be made each time there is a change in production, process, or control measures which could result in an increase in airborne concentrations of soluble platinum salts.

(2) A written record of the determination shall be made and shall contain at least the following information:

(i) Any information, observations, or calculations which may indicate employee exposure to soluble platinum salts;

(ii) Any measurements of soluble platinum salts taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to soluble platinum salts; and

(iv) Date of determination, work being performed at the time, location within work site, name, and social security number of each employee considered.

(3) If the employer determines that any employee may be exposed to soluble platinum salts at or above the action level, the exposure of the employee in each work operation who is believed to have the greatest exposure shall be measured. The exposure measurement shall be representative of the maximum eight-hour time weighted average exposure of the employee.

(4) If the exposure measurement taken pursuant to paragraph (b) (3) of this section reveals employee exposure to soluble platinum salts at or above the action level, the employer shall:

(i) Identify all employees who may be exposed at or above the action level; and

(ii) Measure the exposure of the employees so identified.

(5) If an employee exposure measurement reveals that an employee is exposed to soluble platinum salts at or above the action level, but not above the permissible exposure, the exposure of that employee shall be measured at least every two months.

(6) If an employee exposure measurement reveals that an employee is exposed to soluble platinum salts above the permissible exposure, the employer shall:

(i) Measure the exposure monthly of the employee so exposed; and

(ii) Institute control measures as required by paragraph (d) of this section; and

(iii) Individually notify, in writing, within five days, every employee who is found to be exposed to soluble platinum salts above the permissible exposure. The employee shall also be notified of the corrective action being taken to reduce the exposure to at or below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to soluble platinum salts

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

below the action level, the employer may terminate measurement for the employee.

(8) For purposes of this paragraph, employee exposure is that which would occur if the employee were not using a respirator.

(c) Methods of measurement. (1) An employee's exposure shall be obtained by any combination of long term or short term samples which represents the employee's actual exposure averaged over an eight-hour work shift (See Appendix B (iv) of this section).

(2) The method of measurement shall have an accuracy, to a confidence level of 95 percent, of not less than that given in Table 1.

Table 1

Concentration

Required Accuracy

Above permissible exposure

$\pm$ 25%

At or below permissible exposure

and above the action level

$\pm$ 35%

At or below the action level

$\pm$ 50%

(d) Compliance. (1) No employee shall be exposed to soluble platinum salts above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of soluble platinum salts shall be controlled to at or below the permissible exposure by engineering and work practice controls:

(i) Engineering and work practice controls shall be instituted to reduce exposures to at or below the permissible exposure, except to the extent that such controls are not technically feasible.

(ii) Wherever engineering and work practice controls are not sufficient to reduce exposures to at or below the permissible exposure, they shall nonetheless be used to reduce exposure to the lowest level feasible and shall be supplemented by respirators in accordance with paragraph (d)(4) of this section.

(3) Engineering controls. When mechanical ventilation is used to control exposure, measurements which demonstrate system effectiveness, for example, air velocity, static pressure, or air volume, shall be made at least every three months. Measurements of system effectiveness shall also be made within five days of any change in production, process, or control which might result in an increase in airborne concentrations of soluble platinum salts.

(4) Compliance with the permissible exposure shall not be achieved by the use of respirators except:

(i) During the time period necessary to install or implement engineering or work practice controls; or

(ii) In work situations in which engineering and work practice controls are technically not feasible; or

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

(iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of soluble platinum salts to at or below the permissible exposure; or

(iv) In emergencies.

(5) Where respirators are needed and permitted under this paragraph to reduce employee exposure, the employer shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.

TABLE 2 RESPIRATORY PROTECTION FOR SOLUBLE PLATINUM SALTS

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Particulate Concentration	
0.1 mg/M3 or less	A high efficiency particulate filter respirator with a full facepiece. ----- Any supplied-air respirator with a full facepiece, helmet or hood. ----- Any self-contained breathing apparatus with a full facepiece.
2 mg/M3 or less	A powered air-purifying respirator with a high efficiency particulate filter and a full facepiece, helmet, or hood.
4 mg/M3 or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet or hood operated in continuous-flow mode.
Greater than 4 mg/M3 or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. ----- A combination respirator which includes a Type C supplied air respirator with a full facepiece operated in pressure demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

(6) Respirators shall be approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) or by the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.

(7) The employer shall institute a respiratory protection program in accordance with § 1910.134(b), (d), (e), and (f).

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

(e) Fire and safety. The employer shall familiarize himself with the information contained in the Substance Technical Guidelines (Appendix B of this section) for soluble platinum salts.

(f) Personal protective equipment. (1) Employers shall provide and ensure that employees use impervious clothing, gloves, face shields (eight-inch minimum) and other appropriate protective clothing necessary to prevent skin contact with soluble platinum salts or liquids containing soluble platinum salts, where skin contact may occur. Face shields shall comply with § 1910.133(a)(2), (a)(4), (a)(5), and (a)(6).

(2) Employers shall ensure that employees whose clothing may have become contaminated with soluble platinum salts or liquids containing soluble platinum salts change into uncontaminated clothing before leaving the work premises.

(3) Employers shall ensure that clothing contaminated with soluble platinum salts is placed in closed containers for storage until it can be discarded or until the employer provides for the removal of soluble platinum salts from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the soluble platinum salts, the employer shall inform the person performing the operation of the hazardous properties of soluble platinum salts.

(4) Employers shall ensure that non-impervious clothing which becomes contaminated with soluble platinum salts be removed promptly and not reworn until the soluble platinum salts are removed from the clothing.

(5) Employers shall provide and ensure that employees use safety goggles (cup-cover type dust and splash safety goggles) which comply with § 1910.133 (a)(2)-(a)(6) where soluble platinum salts or liquids containing soluble platinum salts may contact the eyes.

(g) Spills and disposal. In the event that soluble platinum salts are spilled, the employer shall immediately provide available ventilation and then clean up the spill.

(h) Sanitation. (1) Employers shall ensure that employees whose skin becomes contaminated with soluble platinum salts promptly wash or shower to remove any soluble platinum salts from the skin.

(2) Employers shall ensure that employees do not eat or smoke in areas where soluble platinum salts or liquids containing soluble platinum salts are handled, processed or stored.

(3) Employers shall ensure that employees who handle soluble platinum salts or liquids containing soluble platinum salts wash their hands thoroughly before eating, smoking or using toilet facilities.

(i) Training and information. (1) Each employer who has a workplace in which soluble platinum salts is present shall keep a copy of this regulation with Appendixes A, B and C at the workplace. This material shall be made readily available to affected employees.

(2) Each employer who has employees exposed to soluble platinum salts above the action level or employees who may have skin or eye contact with soluble platinum salts or liquids containing soluble platinum salts, or employees who work where a spill of soluble platinum salts may occur, shall annually:

(i) Inform affected employees of the information contained in the Substance Safety Data Sheet for soluble platinum salts (Appendix A of this section);

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

(ii) Advise affected employees as to the signs and symptoms of exposure to soluble platinum salts.

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of exposure to soluble platinum salts which are listed in Appendix A of the section; and

(iv) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to soluble platinum salts.

(j) Medical surveillance. (1) The employer shall provide medical procedures as required by this paragraph. All medical procedures shall be performed by or under the supervision of a physician at no cost to the employee.

(2) The employer shall make available to each employee who is to be exposed to soluble platinum salts or liquids containing soluble platinum salts or airborne concentrations of soluble platinum salts at or above the action level a medical examination which shall include a medical history and physical examination with emphasis on the lungs, upper respiratory tract and skin.

(3) The employer shall obtain from the physician, as a record of the examination, a written opinion which conforms with paragraph (j)(7) of this section.

(4) The employer shall make available to each employee, exposed to soluble platinum salts in excess of the action level at 12 months from the date of the employee's first exposure, and at every 12 months of exposure in excess of the action level thereafter, a medical examination which must include a medical history and physical examination with emphasis on the lungs, upper respiratory tract, and skin.

(5) The employer shall obtain from the physician, as a record of the periodic examination, a written opinion which conforms with paragraph (j)(7) of this section.

(6) The employer shall provide to the examining physician the following information:

(i) A copy of this regulation with its Appendixes A, B, and C for soluble platinum salts;

(ii) A description of the employee's duties as they relate to his exposure to soluble platinum salts;

(iii) A description of any personal protective equipment and respirators required to be used;

(iv) The results of any measurements, which may indicate the affected employee's exposure;

(v) The affected employee's anticipated exposure; and

(vi) Upon request of the physician, any available information from previous medical examination of the affected employee.

(7)(i) The physician's written opinion shall be a signed statement by the examining physician specifically stating: (A) Whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to soluble platinum salts or would directly or indirectly aggravate any detected medical condition;

(B) Any recommended limitations upon the employee's exposure to soluble platinum salts, including limitations upon the use of personal protective equipment and respirators;

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

(C) That the employee has been informed by the physician of any detected medical conditions which require further medical examination or treatment.

(ii) The physician's written opinion shall not reveal specific medical findings or diagnoses unrelated to exposure to soluble platinum salts.

(iii) The employer shall provide the employee with a copy of the physician's written opinion.

(8) No employee shall be exposed to soluble platinum salts, liquids containing soluble platinum salts or airborne concentrations of soluble platinum salts in such a way as would put the employee at increased risk of material impairment of his health from such exposure. This determination may be based on the physician's written opinion.

(9) The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured through exposure to soluble platinum salts.

(10) If an employee refuses any required medical examination, the employer shall inform the employee of the possible health consequences of such refusal and obtain a signed statement from the employee indicating that the employee understands the risks involved by refusing to be examined.

(11) No medical procedure which would be performed pursuant to this section need be performed if records of a previous such procedure performed within the past six months are acceptable to the examining physician.

(k) Recordkeeping. (1) Exposure determination. (i) The employer shall keep an accurate record of all determinations required to be made pursuant to paragraph (b)(1) of this section.

(ii) This record shall include the written determination required in paragraph (b)(2) of this section.

(iii) This record shall be maintained until replaced by a more recent record.

(2) Exposure measurements. (i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to soluble platinum salts.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to soluble platinum salts which are being monitored;

(C) Sampling and analytical methods used and evidence of their accuracy, including the method, results and date of calibration of sampling equipment;

(D) Number, duration, and results of samples taken; and

(E) Name, social security number and exposure of the employee monitored.

(iii) This record shall be maintained until replaced by a more recent record but in no event for less than one year.

(3) Mechanical ventilation. (i) When mechanical ventilation is used as an engineering control, the employer shall maintain an accurate record of the measurements demonstrating the effectiveness of such ventilation required by paragraph (d)(3) of this section.

(ii) This record shall include:

(A) Date of measurement;

(B) Type of measurement taken;

(C) Result of measurement.

(iii) These records shall be maintained for at least one year.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

(4) Employee training and information. (i) The employer shall keep an accurate record of all employee training and information required by paragraph (i) of this section.

(ii) This record shall include:

(A) Date of training;

(B) Name and social security number of employee trained;

(C) Content or scope of training provided.

(iii) This record shall be maintained until replaced by a more recent record.

(5) Medical surveillance. (i) The employer shall keep an accurate record of employee medical surveillance required by paragraph (j) of this section.

(ii) This record shall include:

(A) Results of tests required by paragraph (j)(2) and (j)(4) of this section:

(B) Any employee medical complaints relative to exposure to soluble platinum salts;

(C) A copy of information provided to the physician pursuant to paragraph (j)(6)(ii), (iii), (iv), (v), and (vi) of this section.

(D) Physician's written opinion; and

(E) A signed statement of any refusal to be examined.

(iii) This record shall be maintained for the duration of the employment of the affected employee.

(6) Access to records. (i) All records required to be maintained by this section shall be made available upon request to authorized representatives of the Assistant Secretary of Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health.

(ii) Employee exposure determination and exposure measurement records required to be maintained by this section shall be made available to employees and former employees and their designated representatives.

(iii) Employee medical records required to be maintained by this section shall be made available upon written request to a physician designated by the employee or former employee.

(1) Employee observation of measurement. (1) The employer shall give affected employees or their representatives an opportunity to observe any measurement of employee exposure to soluble platinum salts which is conducted pursuant to this section.

(2) When observation of measurement of employee exposure to soluble platinum salts requires entry into an area where the use of personal protective devices, including respirators, is required, the observer shall be provided with and required to use such equipment and comply with all other applicable safety procedures.

(3) Without interfering with the measurement, observers shall be entitled to:

(i) Receive an explanation of the measurement procedure.

(ii) Visually observe all steps related to the measurement of the airborne concentration of soluble platinum salts that are being performed at the place of exposure; and

(iii) Record the results obtained.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

NOTE: The information contained in the following appendixes is advisory in nature and is not intended, by itself, to create any additional obligations not otherwise imposed or detract from any existing obligation.

APPENDIX A

SUBSTANCE SAFETY DATA SHEET
FOR SOLUBLE PLATINUM SALTS

- I. SUBSTANCE IDENTIFICATION
 - A. Substance: Soluble platinum salts
 - B. Permissible Exposure: 0.002 milligrams of soluble platinum salts per cubic meter of air (mg/M3) averaged over an eight-hour work shift.
 - C. Appearance and Odor: Sodium chloroplatinate: yellow orange odorless solid; ammonium chloroplatinate: yellow orange solid; platinum tetrachloride: brown-red crystals
- II. HEALTH HAZARD DATA
 - A. Ways in which the chemical affects your body: Soluble platinum salts can affect your body if you inhale them or if they come in contact with your eyes or skin. They may also affect your body if you swallow them.
 - B. Effects of Overexposure:
 - 1. Short-term Exposure: Soluble platinum salts may cause irritation of the eyes, nose, and throat.
 - 2. Long-term Exposure: Repeated exposure to soluble platinum salts may cause both respiratory and skin allergies. The respiratory reaction starts with sneezing and a runny nose. This may be followed by chest tightness, shortness of breath, blue discoloration of the skin and wheezing. The skin reaction consists of an itchy red rash.
 - 3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to soluble platinum salts.
- III. EMERGENCY FIRST AID PROCEDURES
 - A. Eye Exposure: If soluble platinum salts or liquids containing soluble platinum salts get into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.
 - B. Skin Exposure: If soluble platinum salts or liquids containing soluble platinum salts get on your skin, promptly flush the contaminated skin with water. If soluble platinum salts or liquids containing soluble platinum salts penetrate through your clothing, remove the clothing promptly and flush

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

the skin with water. If irritation is present after washing, get medical attention.

- C. Breathing: If you or any other person breathes in large amounts of soluble platinum salts move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.
- D. Swallowing: When soluble platinum salts or liquids containing soluble platinum salts have been swallowed, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.
- E. Rescue: Move affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the locations of the equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

- A. Respirators: Respirators are not the best way to control exposure to soluble platinum salts. You can only be required to wear them for routine use if your employer is in the process of installing controls or control measures prove inadequate. You may be required to wear respirators for non-routine activities or in emergencies. If respirators are worn, they must have a Mining Enforcement and Safety Administration (MESA) or National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.) For effective protection, respirators must fit your face and head snugly. Respirators should not be loosened or removed in work situations where their use is required. If you experience difficulty breathing while wearing a respirator, tell your employer.
- B. Protective Clothing: You must wear impervious clothing, gloves, face shield or other appropriate protective clothing to prevent skin contact with soluble platinum salts or liquids containing soluble platinum salts, where skin contact may occur. Replace or repair impervious clothing that has developed leaks.
- C. Eye Protection: You must wear splash-proof safety goggles where liquids containing soluble platinum salts may contact your eyes. You must wear dust-resistant safety goggles where the solid form of soluble platinum salts may contact your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

- A. Soluble platinum salts must be stored in tightly closed containers in a well-ventilated area.
- B. If your work clothing may have become contaminated with soluble platinum salts or liquids containing soluble platinum

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

- salts, you must change into uncontaminated clothing before leaving the work premises.
- C. You must promptly remove any non-impervious clothing that becomes contaminated with soluble platinum salts and this clothing must not be reworn until the soluble platinum salts are removed from the clothing.
 - D. If your skin becomes contaminated with soluble platinum salts, you must promptly wash or shower to remove the soluble platinum salts from your skin.
 - E. You must not eat or smoke in areas where solid soluble platinum salts or liquids containing soluble platinum salts are handled, processed or stored.
 - F. If you handle soluble platinum salts or liquids containing soluble platinum salts, you must wash your hands thoroughly with water before eating, smoking or using toilet facilities.
 - G. Ask your supervisor where soluble platinum salts are used in your work area and for any additional safety and health rules.

VI. ACCESS TO INFORMATION

- A. Each year your employer is required to inform you of the information contained in this Substance Safety Data Sheet for soluble platinum salts. In addition, your employer must instruct you in the safe use of soluble platinum salts, emergency procedures, and the correct use of protective equipment.
- B. Your employer is required to determine whether you are being exposed to soluble platinum salts. You or your representative have the right to observe employee exposure measurements and to record the results obtained. If your employer determines that you are being overexposed, he is required to inform you of the exposure and of the actions which are being taken to reduce your exposure.
- C. Your employer is required to keep records of exposure determinations, exposure measurements, and medical surveillance. Your employer is required to make records of exposure determinations and your exposure measurements available to you or your representative upon your request. Your employer is required to release your medical records to your physician upon your written request.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
SOLUBLE PLATINUM SALTS

(The standard for soluble platinum salts should not be interpreted to only apply to example substances listed below for which substance specific information has been provided.)

I. PHYSICAL AND CHEMICAL DATA (Sodium Chloroplatinate)

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

- A. Substance Identification
 - 1. Synonyms: None
 - 2. Formula: $\text{Na}_2\text{PtCl}_6 \cdot 6\text{H}_2\text{O}$
 - 3. Molecular weight: 561.9
 - B. Physical and Chemical Data
 - 1. Boiling point (760 mm Hg): Not applicable
 - 2. Specific gravity (water = 1): 2.5
 - 3. Vapor density (air = 1 at boiling point of soluble platinum salts): Not applicable
 - 4. Melting point: Loses water at 100 C (212 F)
 - 5. Vapor pressure at 20 C (68 F): Essentially zero
 - 6. Solubility in water, % by weight at 20 C (68 F): 50
 - 7. Evaporation rate (butyl acetate = 1): Not applicable
 - 8. Appearance and odor: Yellow-orange odorless solid
- II. PHYSICAL AND CHEMICAL DATA (Ammonium Chloroplatinate)
- A. Substance Identification
 - 1. Synonyms: Ammonium hexachloroplatinate
 - 2. Formula: $(\text{NH}_4)_2\text{PtCl}_6$
 - 3. Molecular weight: 443.9
 - B. Physical Data
 - 1. Boiling point (760 mm Hg): Not applicable
 - 2. Specific gravity (water = 1): 3.1
 - 3. Vapor density (air = 1 at boiling point of soluble platinum salts): Not applicable
 - 4. Melting point: Decomposes
 - 5. Vapor pressure at 20 C (68 F): Essentially zero
 - 6. Solubility in water, % by weight at 20 C (68 F): 0.7
 - 7. Evaporation rate (butyl acetate = 1): Not applicable
 - 8. Appearance and odor: Yellow-orange solid
- III. PHYSICAL AND CHEMICAL DATA (Platinum Tetrachloride)
- A. Substance Identification
 - 1. Synonyms: Platinum (IV) Chloride
 - 2. Formula: PtCl_4
 - 3. Molecular Weight: 336.9
 - B. Physical Data
 - 1. Boiling point (760 mm Hg): Not applicable
 - 2. Specific gravity (water = 1): 4.3
 - 3. Vapor density (air = 1 at the boiling point of soluble platinum salts): Not applicable
 - 4. Melting point: Decomposes at 370 C (698 F)
 - 5. Vapor pressure at 20 C (68 F): Not Applicable
 - 6. Solubility in water, % by weight at 25 C (77 F): 58.7
 - 7. Evaporation rate (butyl acetate = 1): Not applicable
 - 8. Appearance: Brown-red crystals
- IV. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA (Soluble Platinum Salts)
- A. Fire
 - 1. Not combustible
 - B. Reactivity
 - 1. Conditions contributing to instability: High temperatures may cause formation of poisonous chlorine gas.
 - 2. Incompatibilites: None.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

3. Hazardous decomposition products: Toxic gases and vapors (such as chlorine) may be released when chlorine containing soluble platinum salts decompose.

4. Special precautions: None.

V. SPILL AND DISPOSAL PROCEDURES (Soluble Platinum Salts)

A. If soluble platinum salts or liquids containing soluble platinum salts are spilled, the following steps should be taken:

1. Ventilate area of spill.

2. Collect spilled material in the most convenient and safe manner and deposit in sealed containers for reclamation, or for disposal in a secured sanitary landfill. Liquids containing soluble platinum salts should be absorbed in vermiculite, dry sand, earth or a similar material.

B. Persons not wearing protective equipment should be restricted from areas of spills until cleanup has been completed.

C. Waste disposal methods: Soluble platinum salts may be disposed of in sealed containers in a secured sanitary landfill.

VI. MONITORING AND MEASUREMENT PROCEDURES (Soluble Platinum Salts)

A. EXPOSURE ABOVE THE ACTION LEVEL: Measurements taken for the purpose of determining employee exposure under this section are best taken such that the average 8-hour exposure may be determined from a single eight-hour sample or two (2) 4-hour samples. Several short time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). Sampling and analyses may be performed by instruments such as detector tubes certified by NIOSH under 42 CFR part 84, portable direct-reading instruments, dosimeters, or by collection of the particulates using a high efficiency membrane filter with subsequent chemical analyses. The method of measurement must determine the concentration of soluble platinum salts to plus or minus 35%.

B. EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE: The monitoring and measurements under this section should be essentially the same as described under paragraph IV. A. Laboratories performing chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association. The method of measurement must determine the concentration of soluble platinum salts to plus or minus 25%.

C. METHODS: Methods meeting these accuracy requirements are available from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 under the title "NIOSH Analytical Methods for Set M" (Order number XXXXXXXXXX).

D. QUALIFIED PERSONS: Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

VII. MISCELLANEOUS PRECAUTIONS (Soluble Platinum Salts)

- A. Store soluble platinum salts in tightly closed containers in a well ventilated area.
- B. Employers should advise employees of all areas and operations where exposure to soluble platinum salts could occur.

VIII. COMMON OPERATIONS (Soluble Platinum Salts)

Common operations in which exposure to soluble platinum salts is likely to occur are: during their production and their use as catalysts; their use for the electrodeposition of metallic platinum; in the refining and reclaiming of platinum; and in the photographic and related industries.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation.

II. TOXICOLOGY

Soluble platinum salts in the form of dusts and sprays cause asthma, skin sensitization, and eye irritation; elemental platinum does not produce these effects. Workers repeatedly exposed to platinum salts in concentrations of from 2 to 20 micrograms per m³ of workroom air developed irritation of the nose and upper respiratory tract with sneezing and running of the eyes, leading to cough, chest tightness, asthmatic wheezing with dyspnea and cyanosis, which became progressively more severe with further exposure. A relative lymphocytosis is commonly present. Skin exposure results in contact dermatitis with pruritis and urticaria; an eczematous eruption often results. Some exposed individuals experience both dermal and respiratory effects due to sensitization; the majority of individuals exposed repeatedly to platinum salts develop some allergic symptoms. Removal from platinum salt exposure results in almost immediate relief of asthma; the dermatitis usually clears in 1 to 2 days but may be persistent. In the eyes, the dusts cause a burning sensation, lacrimation, and conjunctival hyperemia sometimes associated with photophobia.

III. SIGNS AND SYMPTOMS

Irritation of eyes and nose; cough, dyspnea, wheezing and cyanosis; skin sensitization; lymphocytosis.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

Remove from exposure. Immediately flush eyes and skin with water. If swallowed and induce the person is conscious, immediately administer water orally and induce vomiting. Give artificial resuscitation and administer oxygen if indicated. Observe for anaphylaxis and initiate appropriate treatment. Recovery is usually complete.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Soluble platinum salts cause sensitization of the respiratory tract. Asthma and dermatitis have occurred. It is important that the physician become familiar with plant operating conditions in which exposure to soluble platinum salts occur. Those with skin disease may not tolerate the wearing of protective clothing and those with chronic respiratory disease may not tolerate the wearing of negative pressure respirators.

B. PREPLACEMENT

The following medical procedures must be made available to each employee who is exposed to soluble platinum salts:

1. A complete history and physical examination -- The purpose is to detect preexisting conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Persons with a history of asthma, allergies, or known sensitization to soluble platinum salts would be expected to be at increased risk from exposure. Examination of the respiratory system should be stressed. The skin should be examined for evidence of chronic disorders.

C. PERIODIC EXAMINATIONS

The above medical examinations are to be repeated on an annual basis.

VII. REFERENCES

1. American Conference of Governmental Industrial Hygienists: "Platinum (Soluble Salts as Pt)," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, pp. 213-214.

2. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 1125-1130.

3. Browning, Ethel: Toxicity of Industrial Metals (2d ed.), Butterworths, London, 1969, pp. 270-275.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

4. Grant, W. Morton: Toxicology of the Eye (2d ed.), Charles C. Thomas, Illinois, 1974, pp. 843-844.
5. Parrot, J.L., et al: "Platinum and Platinosis - Allergy and Histamine Release Due to Some Platinum Salts," Archives of Environmental Health, 19:685-691, 1969.
6. Levene, G.M.: "Platinum Sensitivity," British Journal of Dermatology, 85:590-593, 1971. and skin and irritation of the eyes.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

REFERENCES AND SOURCES
SOLUBLE PLATINUM SALTS
1910.93

- (f) Personal Protective Equipment, and, (h) Sanitation
Eye: Hamilton and Hardy, "Industrial Toxicology;" Grant, "Toxicology of the Eye"
Skin: Hunter, "Diseases of Occupations;" Browning, "Metabolism and Toxicology of Industrial Metals;" Patty, "Industrial Hygiene and Toxicology;" Schwartz et al., "Occupational Diseases of the Skin;" Campbell et al., "Dermal Irritancy of Metal Compounds," Arch. Environ. Health, Vol. 30, April 1975, p. 168 - 70
Ingestion: Browning, "Metabolism and Toxicology of Industrial Metals;" Patty, "Industrial Hygiene and Toxicology"

COMMENTS

Eye - Classification: 2 and 6

Output statement numbers: 10, 12

Exceptions: 10 and 12 combined

According to Hamilton and Hardy, the dusts and mists of complex platinum salts may cause inflammatory changes of the conjunctivae following contact with the eye. Grant notes that dusts of soluble platinum salts cause "a burning sensation in the eyes, lachrymation and conjunctival hyperemia, sometimes associated with photophobia which suggests that the corneal epithelium may be involved." He continues, "flooding the surface of the eye of normal albino rabbits with 2% to 5% solutions of platinum chloride for 10 minutes causes only slight temporary irritation and no discoloration, but if the epithelium is first removed to permit penetration, the cornea stains light brown . . . (but) with 10 days the stain disappears and the epithelium regenerates."

The data only allow assignment of classifications of 2 and 6. No data could be found as to the effects of eye contact with concentrated solutions.

Skin - Classification: 2 and 6

Output statement numbers: 2, 5b, 7a, 17g, 17i, 20a

Exceptions: See below

Hunter, Browning and others report widespread allergic phenomena occurring in the skin from contact with platinum salts. Hunter notes that "in mild cases (of contact with platinum salts) there was an erythema or urticaria of the hands and forearms . . . (and) in more severe cases the face and neck were involved also." Browning states that most cases of skin lesions are produced by the dry compound, ammonium chloroplatinate, and that these appear in various forms as a scaly erythematous dermatitis, an urticarial rash, a persistence of redness, drying, cracking, scaling and eczematous patches. Patty reports that "dermal manifestations may be acute, consisting of itching and urticaria of exposed areas; subacute, in which the urticaria is replaced by typical contact dermatitis, and chronic in which there is a secondary eczema and persistent contact dermatitis." Schwartz notes the development of sensitivity to platinum chloride in a chemist who suffered a generalized eruption from contact with a

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

small amount of the substance. Campbell et al. tested two platinum salts, $PtCl_2$ and $PtCl_4$. For the former, they arrived at, first, a rabbit 24-hour dermal irritancy score for intact skin of 0.2 out of 4, meaning "non-irritant; probably safe for intact human skin" and secondly a 24-hour rabbit cellular toxicity score for abraded skin of 0.6 out of 4, meaning "non-toxic to cellular components of abraded skin; probably safe for human skin contact." Their overall conclusion on $PtCl_2$ was that it was safe for human skin contact. For $PtCl_4$, the group arrived at a rabbit dermal irritancy score for intact skin of up to 2.7 out of 4, meaning "too irritant for human skin contact; avoid contact." On the rabbit cellular toxicity test for abraded skin, they got up to a 3.8 out of 4, indicating that "cellular toxins too irritant for abraded skin contact; avoidance of contact is advised." Their overall conclusion then on $PtCl_4$ was that it was unsafe for intact and abraded human skin contact.

Classifications of 2 and 6 are concluded appropriate to prevent the cited effects. Statement 2 is used to prevent contact where it "may occur." Statement 5b is applied to both solids and their solutions to prevent prolonged contact with amounts which may cause sensitization (these compounds have negligible vapor pressures).

Ingestion - Classification: 2 and 6

Output statement numbers: 19, 20a

Exceptions: None

Browning, citing the work of Hofmeister, emphasizes the "toxic effect on animals of platinum itself differs essentially from that of the complex salts." She continues, "the complex salts act on the nervous system - the action of these salts is not due to separate components (platinum and base) but to that of the molecule as a whole on sensitive tissues." She reports that in subcutaneous injection to frogs and rabbits of di- and tetravalent platinum with ammonium salts, 0.02 g was the lowest level for the appearance of toxic symptoms. Platinum diammonium chloride given in doses of 1 g caused no symptoms. The most characteristic feature was stated to be the appearance of epileptiform convulsions separated by symptom-free periods. She adds that death is usually preceded by coma and in non-lethal cases there is observed hyperirritability, restlessness, motor excitement and heart action, delayed due to toxic action on the vagus center. Patty reports a relative lymphocytosis commonly present from solutions of complex platinum salts.

Though the effects of ingestion of these compounds would not appear to have been studied, it is concluded to be reasonable, based on the effects of other routes of entry, for them to be assigned classifications of 2 and 6.

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

- Kirk-Othmer, "Encyclopedia of Chemical Technology," Vol. 15, p. 862 (K-O)
- "Gmelin's Handbuch der Anorganischen Chemie," Vol. 68(C), p. 148 (Gmelin)

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

Chemical Rubber Company, "Handbook of Chemistry and Physics" (CRC)
Sources of data items used:

- I. A. 1. Synonyms: K-O; CRC
2. Formula: K-O; CRC
3. Molecular weight: ADL; CRC
- B. 1. Boiling point: Not applicable
2. Specific gravity: Gmelin; CRC
3. Vapor density: Not applicable
4. Melting point: Gmelin; CRC
5. Vapor pressure: ADL
6. Solubility in water: Gmelin; CRC
7. Evaporation rate: Not applicable
8. Appearance and odor: Gmelin; CRC
- II. A. 1. Flash point: Not applicable
2. Autoignition temperature: Not applicable
3. Flammable limits: Not applicable
4. Extinguishing media: Not applicable
5. Special fire fighting procedures: ADL
6. Unusual fire and explosion hazards:
- B. 1. Conditions contributing to instability: ADL
2. Incompatibilities: None
3. Hazardous decomposition products: Gmelin
4. Special precautions: None
- III. A. Steps if released or spilled: ADL
C. Waste disposal method: ADL
- V. Miscellaneous precautions: ADL

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

- Considine, D. M., "Chemical and Process Technology Encyclopedia," McGraw Hill, 1974 (Considine)
- Hunter, D., Milton, R. and Perry, K. M. A., "Asthma Caused by the Complex Salts of Platinum," British Journal of Industrial Medicine, 2:92 - 98, 1945 (Hunter)
- International Labour Office, "Encyclopedia of Occupational Health and Safety," 1972 (ILO)
- Kirk, R. and Othmer, D., "Encyclopedia of Chemical Technology," Interscience Publishers, 2nd edition, 1972 (K-O)
- Mark, H. F. Gaylord, W. G. and Bikales, N. M., "Encyclopedia of Polymer Science and Technology," Interscience Publishers, 1964 (Poly Sci)
- "Merck Index of Chemicals and Drugs," Merck and Co., Inc., 8th edition, 1968 (Merck)
- Parrot, J. L., et al., "Platinum and Platinosis," Archives of Environmental Health, 19:685 - 691, 1969 (Parrot)
- Patty, F. A., "Industrial Hygiene and Toxicology," Vol. II, Interscience Publishers, 1962 (Patty)
- Shreve, R. N., "Chemical Process Industries," McGraw Hill, 1956 (Shreve)

-References for Specific Use/Exposure

- 1. K-O, Merck, Patty, Poly Sci, Shreve
- 2. Considine, Hunter, ILO, K-O
- 3. Hunter, ILO, K-O
- 4. Merck, Parrot
- 5. Hunter, ILO

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

References for Specific Control Methods

Hunter, ILO and Parrot were the references used in all of the Specific Control Methods.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Soluble platinum salts

D. O. L. STANDARD: 0.002 mg/M3

WARNING PROPERTIES:

Eye Irritation Level: Grant reports that "the dusts of soluble platinum salts cause a burning sensation in the eyes, lacrimation, and conjunctival hyperemia, sometimes associated with photophobia, which suggests that the corneal epithelium may be involved." No quantitative information is given, however, concerning the concentrations of the dusts which produce these symptoms.

IDLH: Air concentrations at or slightly above the TLV of soluble Pt salts can elicit the allergic response in sensitized workers. Therefore, the IDLH cannot be set to protect these sensitized individuals. The available toxicological information does not indicate any toxic effects in nonsensitized individuals. For the purpose of this standard, therefore, since there is no evidence of an IDLH concentration for nonsensitized individuals, respirators have been selected on the basis of the protection factor afforded by each device.

Other Toxicological Information: Patty states the "four studies of the effects of exposure to soluble, complex Pt salts of the form Na_2PtCl_6 describe essentially the same findings, which are designated variously as Pt allergy, platinosis, or Pt asthma. The respiratory syndrome starts with repeated sneezing, followed by profuse running of the nose with a watery mucous discharge. This is followed by tightness of the chest, shortness of breath, cyanosis, and a wheeze. A relative lymphocytosis commonly is present. . . Roberts considers the incidence of platinosis to be 100 per cent; in about 40 per cent the condition is asymptomatic but with conjunctivitis, inflammation of the nose and throat, and lymphocytosis. Some exposed individuals experience both dermal and respiratory effects . . . Roberts suspects that platinosis produces a low-grade pulmonary fibrosis, on the basis of chest roentgenograms, but finds no evidence that Pt has carcinogenic activity."

Browning reports that "the complete syndrome of respiratory disturbance and dermatitis often, but not always, appears in the same individual; it is now regarded as an allergic response . . . Different compounds appear to produce the same effect, though the highest incidence, in the cases investigated by Hunter et al., was among those in contact with the dry compound (ammonium chloroplatinate) packers, maintenance men and those employed in that part of the refinery where dry ammonium chloroplatinate was crushed." Other compounds mentioned by Browning which elicit the same response are sodium chloroplatinate, chloroplatinic acid, and potassium chloroplatinate.

The Documentation of TLV's notes that most of the investigators who have studied industrial exposures to soluble Pt salts indicate that metallic Pt dust causes no problems. The TLV of 0.002 mg/M3 for soluble platinum salts "is recommended to protect against respiratory di

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

USE/EXPOSURE AND CONTROL DOCUMENT
SOLUBLE PLATINUM SALTS

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of dust, mist or spray and skin contact with dust, solid, mist, spray or liquid during the manufacture and use of platinum soluble salts as catalysts (catalysts - platinic oxide, platinic chloride, platinized asbestos or magnesium sulfate with platinic chloride; uses of catalysts - production of high octane gasoline, nitric acid, sulfuric acid, vinyl esters, petrochemicals, pharmaceuticals)	A,B	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, protective clothing)
2.	Inhalation of dust, mist or spray and skin contact with dust, solid, mist, spray or liquid during the refining of platinum ore and the reclaiming of platinum for reuse (jewelers and chemists). There is a wet and dry process for refining the ore - the exposure to the dust in the dry process is the more dangerous. The platinum is precipitated with ammonium chloride to form complex salts. These salts are washed, filtered, dried and calcined.	A,B	Local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, protective clothing)
3.	Inhalation of mist or spray and skin contact with mist, spray or liquid during use in the electroplating industry. Platinum may be deposited from solution of platinic chloride, sodium hexahydroxy platinate for surface protection, decorative purposes, to facilitate subsequent opera-	A,B	Local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, protective clothing)

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for PLATINUM, SOLUBLE SALTS AS PT

tions such as metal bonding
or soldering.

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| 4. | Inhalation of dust and skin contact with dust or solid during the manufacturing, processing and maintenance of equipment of soluble platinum salts (platinic chloride, platinic iodide, platinic nitrate, potassium tetrachloroplatinate, barium platinous cyanide) | A,B | Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, protective clothing) |
| 5. | Inhalation of dust and skin contact with dust, solid or liquid during use in the photographic and related industries (potassium chloroplatinate - a photographic paper sensitizer, barium platinous cyanide - on x-ray fluorescent screens) | A,B | Local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, protective clothing) |

- A -- Inhalation
- B -- Skin and eye contact resulting in localized irritation
- C -- Ingestion
- D -- Skin contact resulting in absorption and subsequent systemic poisoning