Test for screening...

ASBESTOS

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ABSTRACT: A colorimetric test was developed to detect the presence of asbestos (1332214) in bulk samples by the formation of color complexes from added magnesium (II) (Mg) and iron (II) (Fe). In the magnesium test, several drops of Mg reagent are added directly to the sample, which is washed with glycerine and mixed with phosphoric acid and sodium hydroxide. A blue color indicates that chrysotile (12001295) may be present. In the iron test, several drops of Fe reagent are added to the sample, which is washed with an acetic and sulfuric acid mixture. Each acid then is added separately, and hydrofluoric acid also is added. A red color indicates the possible presence of amosite (12172735) or crocidolite (12001284). If both tests give a negative response, the probability is low that asbestos is present. If the presence of Mg or Fe is indicated, further analysis to confirm, identify, and quantitate the asbestos is required.

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TEST FOR SCREENING ASBESTOS

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TEST FOR SCREENING ASBESTOS

I. SCOPE AND APPLICATION

This colorimetric test is applicable to the detection of magnesium (II) and iron (II) from asbestos in bulk samples. These samples include sprayed on asbestos as well as ceiling tiles. The test is simple and can be readily used in the field to screen for the presence or absence of asbestos. The amount of the sample needed for the test is only about the size of a large pea.

II. PRINCIPLE

The test is based upon the formation of color complexes with Mg^{+2} and Fe^{+2} released from asbestos. The Mg^{+2} from chrysotile is complexed with p-nitrophenylazo-α-naphthol. The Fe^{+2} from crocidolite and amosite is complexed with 1, 10-phenanthroline. A positive test is indicated by the formation of colored complex for Mg^{+2} and/or Fe^{+2}, and it indicates possible presence of asbestos.

III. INTERFERENCES

The test is a colorimetric spot test for Mg^{+2} and Fe^{+2}, and is not specific for asbestos.

A bulk sample may contain Mg and Fe compounds other than asbestos. Without treating the sample as in the Procedure, a few drops of color forming reagents are added directly to the sample. If either color forms, an interferring substance is present and the sample must be cleaned before the test is conducted to eliminate the interference. In this cleaning process, plaster, mineral wool, fiberglass, and soluble Mg and Fe compounds are removed before the screening test, preventing their interference.

IV. SENSITIVITY, PRECISION, AND ACCURACY

A sample containing more than 1% asbestos gives a positive color reaction.

A total of 198 various field samples were tested before the Acid Wash steps were added to the Iron Test procedure. Results are listed below:

Results of the screening test without the Acid Wash.

	True Positive	False Positive	True Negative	False Negative
No. of Samples	79	50	69	0
% of Total	40	25	35	0

With the Acid Wash, the following results were obtained from 13 samples.

Results of the screening test with the Acid Wash.

	True Positive	False Positive	True Negative	False Negative
No. of Samples	5	0	8	0
% of Total	38	0	62	0

V. APPARATUS

1. Teflon dish or white plastic plate
2. Plastic or glass rod
3. Dropping plastic pipet
4. 15 mL disposable plastic beaker
5. 25 mm size 0.8 μm mixed cellulose ester filter
6. 25 mm size polyvinyl chloride filter
7. 25 mm Swinnex filter holder and gasket
8. 10 mL disposable plastic syringe

VI. REAGENTS (Reagent Grade)

1. Phosphoric acid, concentrated.

2. 10 N sodium hydroxide - Dissolve 40 g of NaOH in 100 mL of water.

3. Mg Reagent - Dissolve 1 mg of p-nitrophenylazo-α-naphthol in 100 mL of 2 N NaOH. Age at least a day. This reagent is stable over a month.

4. Hydrofluoric acid - Dilute 20 mL of HF with 20 mL of water. Add 0.6 mL of concentrated HCl.

5. Fe Reagent - Dissolve 2 g of 1,10-phenanthroline in 50 mL of ethanol. This reagent is stable over a month.

6. Glycerin, reagent grade.

7. Acetic acid, concentrated glacial.

8. Sulfuric acid, concentrated.

9. Double de-ionized water.

VII. PROCEDURE

A. Magnesium Test

1. Add a few drops of Mg Reagent directly to the sample. If blue color appears, wash the sample with glycerin before the test. Any sample containing plaster is also washed with glycerin.

   Glycerin Wash

   a. Place a small portion of sample, about the size of a large pea, in a plastic beaker.

   b. Add 5 drops of glycerin and mix well with a plastic rod or spatula.

   c. Rinse the plastic rod with a small amount of water into the beaker.

   d. Filter the sample through the filtration assembly consisting of a syringe attached to the Swinnex filter holder loaded with a mixed cellulose ester filter and a gasket.

   e. Filter with a minimum of 5 washings or about 50 mL of water.

   f. Transfer the filter to a Teflon dish for the Magnesium test.

2. Add a drop of H_3PO_4 and mix well by grinding the sample with a plastic rod.

3. Add 2 drops of 10 N NaOH and mix well.

4. Add 5 drops of Mg Reagent and stir briefly. Note any color change.

5. Add 5 more drops of Mg Reagent and observe the final color.

6. A blue color indicates that chrysotile may be present.

7. Samples giving a positive test may be sent to a laboratory for confirmation. If the magnesium test is negative, the sample must be tested for iron.

B. Iron Test

1. Add few drops of Fe Reagent directly to the sample. If a red color appears, wash the sample with the acetic--sulfuric acid mixture before the test. Samples containing fiberglass or mineral wool are also washed with the acid mixture.

Acid Wash

1. Place a small portion of the sample, about the size of a large pea, in a plastic beaker.

2. Add 5 drops of concentrated acetic acid.

3. Add 5 drops of concentrated sulfuric acid.

4. Mix well and ultrasonicate if available for 5 minutes.

5. Filter the sample through a polyvinyl chloride filter with a minimum of 5 washings or about 50 mL of water.

6. Transfer the filter to a Teflon dish and proceed with the Iron Test.

2. Add a drop of HF solution and mix well.

3. Add 5 drops of Fe Reagent and observe the development of red color.

4. The red color indicates that amosite or crocidolite may be present.

C. Notes

If both parts of the test give negative responses, there is a low probability that any asbestos is present. Once the presence of magnesium and/or iron is indicated, further analysis, if needed, is done in the laboratory to confirm, identify the type, and quantitate the percentage of asbestos.

VIII. REFERENCE

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