

**Conclusions:** These results could be a guide for surveillance strategies. For the control of occupational silica exposure one strategy should be performed by definitions of site sentinel events and each Brazilian region would develop its own JEM according to their particular occupational characteristics. Actions should be defined jointly by the government, the labor unions and universities throughout the country.

#### 11 Silver-coated capillary pore filters for crystalline silica analysis

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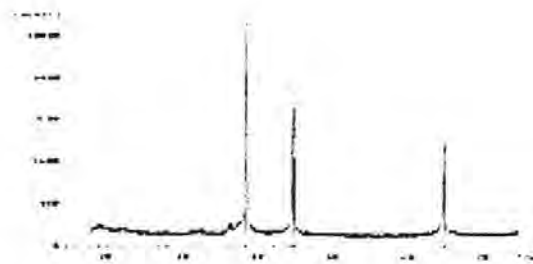
**Objectives:** A suitable alternative to silver metal membrane filters was investigated for use in X-ray diffraction analysis of crystalline silica. Preliminary work with coated filters indicated that an improvement in sensitivity could be gained by using metal-coated capillary pore filters rather than the conventional silver metal filters. The feasibility of producing silver-coated capillary pore filters as an alternative to silver metal filters was explored.

**Methods:** Capillary pore filter substrates were coated with silver. Suitable capillary pore substrate materials were chosen based on the following characteristics: commercial availability, chemical resistance to tetrahydrofuran (an ether used in sample preparation), smoothness of surface, appropriate pore size, absence of interferences in the X-ray diffraction spectrum, and ease of handling. The substrate materials studied were polypropylene, nylon, polycarbonate, and teflon. A Denton DV-512 High Vacuum Evaporator was used to thermally evaporate an even silver coating onto the test substrate filters. The silver-coated filters were analyzed by stereomicroscope and scanning electron microscopy to determine the quality of the coated surface. In addition, as a marker of change in the filtration characteristics, multiple pore measurements were taken on the test filters before and after coating. X-ray diffraction spectra of the coated filters were compared to X-ray diffraction spectra of currently available silver metal membrane filters. Crystalline silica was deposited onto the test filters and X-ray diffraction spectra were obtained in order to investigate analytical sensitivity.

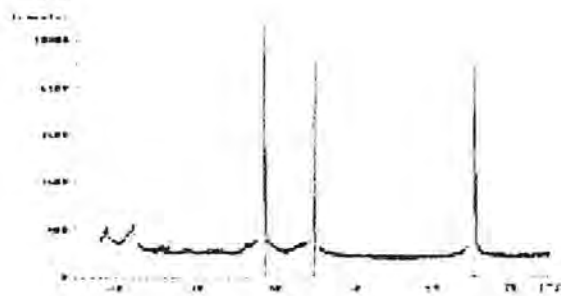
**Results:** Surface analysis of the coated filters showed a clean, even coating of silver. The filtration characteristics of the substrate filters were not changed significantly by the deposition of the thin silver layer on the surface. X-ray diffraction spectra of the coated filters showed no interferences. Nylon and polypropylene were the substrate materials which proved best for further study and these materials are commercially available in the required 0.45  $\mu\text{m}$  pore size. X-ray diffraction analysis of coated filters deposited with crystalline silica have shown an average 2-fold increase in sensitivity in measuring levels of crystalline silica. In addition, there is minimal preferred orientation of the particles on the filter. To explore the feasibility of commercial production of silver-coated capillary pore filters, polypropylene and nylon substrate materials were commercially coated and cut into final 25 mm size filters. These filters were tested and proved equivalent to the silver metal membrane filters conventionally used. The retail cost

of the final product is estimated to be substantially lower than the retail cost for conventional silver metal membrane filters.

**Conclusions:** An alternative filter for X-ray diffraction analysis of crystalline silica was developed and tested. Silver-coated polypropylene and nylon capillary pore filters have been shown to be equivalent to the conventional silver metal membrane filters. An improvement in sensitivity for crystalline silica measurement has been observed.



Sterlitech Silver Metal Membrane Filter



Silver-coated Capillary Pore Filter

X-ray diffraction spectra to compare silver metal and coated capillary pore filters

#### 12 Surveillance and control of silica dust exposure during a high speed railway track in tunnel construction

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**Objectives:** Silica exposure risk control during the tunnel excavation for the construction of the high speed railway track connecting Florence to Bologna.

**Methods:** Following a silica risk assessment carried out by the company appointed for the excavation works which showed high levels of airborne silica dust, the local Health and Safety Unit prescribed several technical improvements dealing with

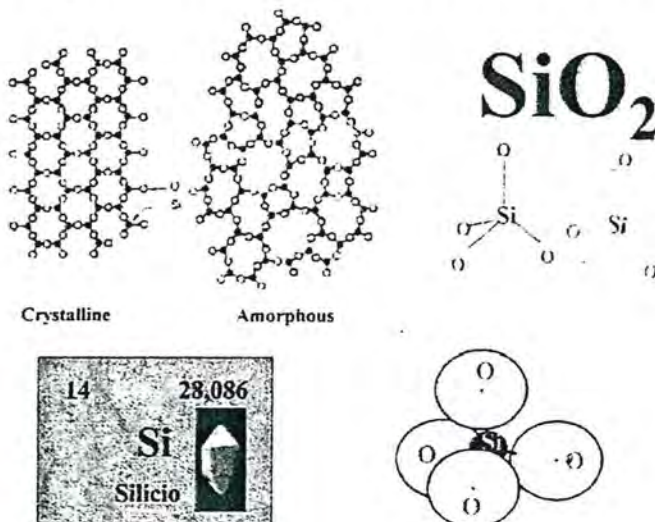
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