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ABSTRACT BOOK

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Plenary lectures

Naturally occurring asbestos in serpentinite quarries: the Valmalenco case history

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The Valmalenco serpentinite, a worldwide marketed dimension and decorative stone, derives from the Malenco unit (central Alps, northern Italy), a huge ultramafic body exposed over an area of 130 km^2, at the Penninic to Austroalpine boundary zone. However, the same area was once subject to chrysotile mining, from the XIX Century till 1975: for these reasons, the Valmalenco district is an excellent "naturally occurring asbestos" (NOA) case history. To evaluate asbestos exposure and contamination, extensive sampling of rocks, stream sediments, soils and airborne particulate was carried out since 2004, in cooperation with INAIL. The asbestos quantification in massive samples was performed by SEM-EDS, considering specific criteria for the NOA environment (careful sample preparation and morphological – dimensional criteria). All commercial stone varieties can be considered virtually asbestos-free, largely below the 1000 ppm threshold. On the contrary, there is a slight chrysotile contamination close to the lode selvages, micro-fractures and veins. Little amounts of chrysotile (generally < 400 ppm) were detected in stream sediments and soils, as well as traces of asbestiform tremolite (< 150 ppm, probably linked to talc lodes). The analysis of air samples (PCM, SEM-EDS and TEM) showed a complex environment, with significant analytical difficulties, especially due to abundant pseudo-fibrous antigorite fragments (falling into the WHO fibre definition criteria). The assessed occupational exposure levels (quarries) were mainly below 100 ff/L, except for some specific cases. Critical issues were detected during stone processing (especially gangsaw cutting): even the presence of small chrysotile contamination on the block surfaces can generate a lot of airborne fibres, due to the extreme mechanical fragmentation of the cutting process. The chrysotile concentrations at quarry property borders and at nearest villages were always below the Italian environmental exposure limit (2 ff/L). SEM-EDS and PCM results show no agreement, because of the abundance of extremely thin chrysotile fibrils (< 0.1 μm), undetectable by PCM. TEM investigations highlighted in some cases abundant chrysotile "micro-fibrils" (< 5 μm, not countable per WHO criteria), supposedly linked to "high-energy" mechanical processing (*e.g.*, diamond disk and block-cutter). To reduce the exposure risk, it is of crucial importance to avoid the interception of chrysotile veins during quarrying, as well as performing the block squaring-off directly in the quarry: a key issue is the continuous structural and petrographic control of quarry fronts and commercial blocks. Prevention actions were planned based on the analytical results, and are still in progress, under coordinated supervision of the local authorities. A specific protocol for airborne asbestos determination in NOA environment was recently released by INAIL.