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Mineralogy and geochemistry of asbestos observed in soils developed within San Severino Lucano village (Southern Italy)

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Concerns of potential health effects from disturbed natural occurrences of asbestos (NOA) have resulted in environmental investigations worldwide, including Basilicata region (Southern Italy). Indeed, in this region, an increased number of lung disease were related to the environmental exposure to asbestos tremolite soils sources. On the basis of the effects of asbestos on biological systems, several authors ascribe the asbestos-fibres toxicity to the synergetic effect of fibre size, crystal habit, surface reactivity, ability to generate Reactive Oxygen Species (ROS), biopersistence and chemical composition. The human health risks are based on the potential fibres inhalation, when they become airborne through rocks (e.g. serpentinite) weathering or human activities producing dust. In this frame, this paper reports the results of a detailed study on soils that developed on serpentinite bedrocks cropping out within the San Severino Lucano village (Basilicata region, Italy) in order to assess the presence of NOA potentially hazardous to human health (Bloise et al., 2016a).
Twelve soil samples have been collected within the village and characterized by using different analytical techniques such as X-ray Fluorescence (XRF), X-ray powder diffraction (XRPD), scanning and transmission electron microscopy combined with energy dispersive spectrometry, analytical electron microscopy (SEM/EDS and TEM/AEM) and thermal analysis (TG, DTG, DSC, DDSC).
Results pointed out as the collected soil samples contain asbestos minerals, clay minerals, diopside, quartz, and Fe-Cr oxides in various amounts. High amounts of chrysotile and asbestos tremolite were found in soils, suggesting that human activities can disturb and provoke the release of inhalable asbestos in the atmosphere, triggering thus mechanisms of hazardous exposition for population. Results also showed a high content of Fe and Cr in chrysotile in some samples, while high amount of Ni was predominantly found in asbestos tremolite. These data suggest that the cytotoxicity of asbestos could also be related to these toxic heavy metal present as impurities in their structure (Bloise et al., 2016b).
Since the dispersion of fibres could be associated with carcinogenic lung cancer, in our opinion in areas where NOA can be found, the institutions should publish local maps indicating areas with mineralogical concern and realization of constructions (e. g. road) must have dust control measure to avoid hazardous exposures.

References

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