14.7 AMPHIBOLE ASBESTOS CONTAMINATION IN MINERAL RAW MATERIALS: THE EXAMPLE OF SOME BRAZILIAN TALC DEPOSITS

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Abstract

Amphibole asbestos is prohibited in several countries, including Brazil. Present-day federal legislation in Brazil allows exploitation, industrialization, use, commercialization and transport of chrysotile asbestos only. Amphibole asbestos can occur in variable amounts in other mineral raw-materials for the industry, such as talc, a layered Mg-OH silicate with a wide range of industrial uses. The presence of amphiboles in talc is a consequence of the geological conditions prevailing during the formation of this type of metamorphic ore deposit. Legislation on amphibole asbestos may be used to control and prevent the use of such contaminated materials, although prohibition in these cases is complicated due to commercial interests, misinformation and the lack of well-established analytical routines to identify contamination. The identification of even trace amounts of asbestiform amphiboles is enough to disqualify any material for industrial purposes.

In the southern region of Minas Gerais State, southeastern Brazil, talc is exploited in several small scale open-pit mines, the production of which is mostly consumed in the industrial districts in and around São Paulo city. Amphibole asbestos is present in talc “ores” from Minas Gerais, as indicated by preliminary results on samples from the Carandaí talc district. Analysed talc samples contain widely variable amounts of fibers of calcic amphibole related to the tremolite-actinolite series. Although in this particular case amphibole

asbestos is not an ore mineral itself, its presence associated with talc causes mine workers and others to be exposed to it. Inhalation of asbestos occurs during mining, grinding, sieving and transportation of talc, since security norms and equipment applied in asbestos mining are not properly used while handling contaminated talc. Furthermore, final users of contaminated talc do not know the risks, which means that asbestos inhalation may take place far away from talc mining districts.

This scientific communication presents the analytical techniques (transmitted polarized light microscopy, scanning electron microscopy, X-ray diffraction) used by us to identify and quantify the presence of asbestiform amphibole in geological samples. Analytical routines have to consider heterogeneity in mineralogical composition of the samples, including wide variation in amphibole amounts as well as the compositional variation of the amphibole itself. X-ray diffraction (XRD) is a powerfull tool to perform mineralogical analysis at relatively low cost, and seems to be the more efficient way to routinely control mineral contamination in geological samples. Mineral identification by XRD is based on data sets of mineral structures. However, the strong morphological anisotropy of fibers causes preferential orientation of mineral grains in the sample, leading to over- and underestimation of structural features of asbestos minerals.