# Assessing the biopersistence of asbestos by nano single crystal diffraction of fibres extracted from human lung tissues

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Chrysotile and amphibole asbestos are the most relevant and widespread mineral fibres included by the International Agency for Research on Cancer (IARC) in Group 1 as Carcinogen for humans [1]. As a result of increasing health concerns, all amphibole asbestos are banned worldwide. Chrysotile, instead, being less biopersistent than amphiboles in the body, is assumed to be less toxic [2]. For this reason, the "safe use" of chrysotile is allowed in 78% of the world's countries [3]. However, to date, there is no conclusive study assessing the stability *in vivo* of the asbestos fibres at the atomic level. Here, for the first time, the crystal structure of an amphibole (amosite) fibre residing in a human lung (exposed to a mixture of chrysotile, amosite and crocidolite) for about 40 years has been determined using synchrotron nano-single crystal diffraction. The calculated structure of the amosite fibre shows that its crystal lattice is preserved. Rare amorphous Mg-depleted relicts of chrysotile were also find. Our results have paramount importance for health, regulatory and economic issues, unambiguously showing that amphibole asbestos fibres are biopersistent at the atomic scale whereas chrysotile is not.

[1] IARC (2012) *IARC Monographs on the Evaluation Carcinogic Risks to Humans* **100C**, 219-309. [2] Bernstein *et al.* (2013) *Crit. Rev. Toxicol.* **43**, 154–183. [3] Gualtieri (2017) *EMU Notes in Mineralogy* **18**, pp. 556.