One of the many paradoxes of asbestos-induced diseases is the high proportion of tremolite found in human lungs when compared to chrysotile. For instance, the chrysotile ore in the Thetford mines region of Quebec contains only a few percent tremolite, but the lung burden of miners from this region is as high as 80% tremolite and 20% chrysotile. In the general population the lung burden of these two minerals is often equal and tremolite-asbestos is believed to be more of a health risk than chrysotile. One hypothesis put forward to explain larger proportions of amphiboles in the human lung when compared to chrysotile, is preferential dissolution of chrysotile in lung fluids. With time the chrysotile fibers dissolve, leaving behind the more insoluble amphibole fibers. However, another explanation might be alteration of chrysotile to tremolite.

In order to investigate the hypothesis that chrysotile might convert to tremolite in the lungs, we calculated the equilibrium constant for the reaction:

$$4 \text{ chrysotile} + 2Ca^{2+} + 10H^{+} \leftrightarrow \text{tremolite} + 7Mg^{2+} + 12H_2O$$

using the SUPCRT92 software package. At 37°C, log K = 60.2 for the above reaction. Assuming pure endmember solid phases, and a Mg concentration of 8.6×10^{-4} M and a Ca concentration of 2.45×10^{-3} M, in lung fluid the ion activity product (IAP) was calculated at pH = 4 and pH = 7, resulting in log IAP = 21.4 and log IAP = 51.4, respectively. Thus according to thermodynamics, at concentrations of Mg and Ca, and pH values typical of those found in plasma, chrysotile should be converted to tremolite. Furthermore, if the activity of tremolite is lowered by significant substitution of Fe for Mg, then tremolite will be even more favored thermodynamically. However, thermodynamic analysis does not tell us whether the reaction will proceed at a measurable rate. Moreover, there might be other, more stable products of the alteration of chrysotile in lung fluids. Experiments (*in vitro*) are currently in progress to determine whether this conversion will proceed over a laboratory time scale.