Chrysotile is a fibrous form of serpentine. Thermal reactions of chrysotile have been extensively investigated (see, e.g. [1]), and thermal treatment is a possible method of converting the material into less hazardous form [2].

Differential thermal and thermogravimetric analyses (DTA/TG) were made simultaneously on a SII NanoTechnology SSC/5200 thermal analyzer using 20 mg samples. A JEOL JEM-3200FSK instrument was used for transmission electron microscopy (TEM), scanning electron microscopy (STEM) and electron diffraction analysis. Thermal transformation of chrysotile from Thetford Mines-Black Lake, LAB Chrysotile Mine, Quebec, Canada, were heated to 1000ºC in dry conditions (N₂) at a rate of 10 ºC/min for DTA/TG analysis was studied by TEM, STEM with EDS and selected area electron diffraction (SAED). A Rigaku Ulitma IV with high temperature attachment was used for in situ X-ray powder diffraction (XRD) analysis.

Morphological changes of many fibrils were observed (Fig. 1). The dehydration products have generally irregular to granular shape and a few other grains show fibrous morphology. Chemical analysis of the thermal products show intermediate compositions of forsterite and enstatite, which means that very tiny grains of enstatite were formed together with forsterite (Fig. 2). The SAED pattern is complex due to the coexistence of forsterite, enstatite, and amorphous areas. Quantitative analysis using XRD shows the ratio of forsterite: enstatite in the dehydration products is 4:1, so amorphous phase will be Si-rich composition.

Keyword: chrysotile asbestos, dehydration product, TG/DTA, TEM, XRD
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