(Durwoll, 1957). For example, the effects of abrasive wear and macro-shear have been investigated. When monitored by x-ray diffraction, chrysotile in brake materials displays structural strain and substructure fragmentation, caused by shear during braking processes (Muzutani et al., 1973). This shear strain produces material fatigue which, with binder pyrolysis, can cause brake lining disintegration at temperatures far below those required for chrysotile dehydroxylation. Therefore, brake lining disintegration may liberate partially altered, or unaltered, chrysotile fibers.

Thermal decomposition of chrysotile

Differential thermal analysis indicates that chrysotile undergoes dehydroxylation at 650°C to 680°C and recrystallizes (anhydrous magnesium silicate to forsterite) (Mg_2SiO_4) at about 810°C to 820°C (e.g., Martinez, 1966, Daykin, 1971, Berry, 1971; Monkman, 1971). These temperature ranges are subject to great variation as a function of the chemistry of the fiber, particle size, instrumental variations, sample packing, etc. Also, forsterite has been noted to form, during prolonged static heating, at considerably lower temperatures (Bates and Comer, 1957; Martinez, 1966, Brindley and Hayami, 1965; Naumann and Dresher, 1966). In general, temperatures in excess of 570°C are required for dehydroxylation and incipient forsterite formation in chrysotile. Extensive study of both the thermal behavior of chrysotile and brake lining composition and design indicates that chrysotile fiber may survive in the decomposed lining dust.

Analysis of brake drum dust (decomposed lining)

Ten samples of automobile brake drum dusts were collected and examined by optical microscopy, x-ray diffraction, transmission electron microscopy

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