2. Collection of wear debris

A disc brake assembly was mounted on an inertia dynamometer [5] so that automobile braking could be simulated in the laboratory. A box surrounded the disc brake assembly and was made airtight by appropriate seals. The heat generated during working was dissipated by a coolant air stream. The air was drawn by an extraction fan through a commercial glass-fibre filter into the box and over the brake assembly. In addition this air stream carried the wear debris onto a filter paper supported on a metal gauze. The filter paper was Whatman no. 90 of 9 cm diameter, the throughput of air being 1700 l min^{-1}.

The debris was produced under conditions of constant (angular) deceleration usually from an initial speed of 880 rev min^{-1} to rest. The brake application temperature, measured by thermocouples rubbing on the brake disc, was 175 °C. These conditions are typical of those which obtain in normal driving of a saloon car. Debris was also produced for a brake application temperature of 40 °C. The examination of the debris reported later showed no significant differences for the two temperatures. The debris consisted of material worn from the brake pads together with iron worn from the disc against which the pads rubbed.

3. Debris analysis

The use of the apparatus to measure the wear rates of frictional material and the elemental identification of the components of the material in the wear debris by neutron activation analysis (NAA) has been reported elsewhere [6]. The following points are relevant to this work.

(a) More than 80% of the wear debris produced was collected and analysed.

(b) The quantity of asbestos in both the friction material and the wear debris was determined by NAA through the trace element concentration. The element chosen was scandium which is present at a level of 4.2 ppm in the raw chrysotile fibre. Previous work had shown that the scandium content did not alter on heating the fibre to a temperature of 900 °C so that it is possible to measure the proportion of the original asbestos fibre present in the debris independently of any chemical or physical transformation during the wear process.

(c) All other components of the friction material were present in the wear debris and the proportions were the same as those for the original friction material.

(d) Some 20 wt.% of the wear debris was iron worn from the disc against which the pad rubbed.

(e) Contamination of the wear debris was insignificant.

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