In contrast to these results on coated HT-S fibres, the aluminium-coated HM-U fibres did not rupture either during tests at 625° C for 100 h or during cooling to room temperature, which is associated with the fibrillar structure of these fibres and their greater resistance to degradation by the aluminium carbide [4].

Acknowledgements

The provision of a research grant and studentship (SJB) by the Science Research Council is gratefully acknowledged.

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Received 7 November
and accepted 16 December 1977.

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Electrical anisotropy of asbestos: a fibrous tremolite

The recent reviews [1, 2] and the data collected by Keller [3] show that very little has so far been reported on the electrical properties of asbestos minerals, particularly on their anisotropy which is also dependent on the structural form of the mineral [3]. In view of this, we extended our previous work on the electrical properties of a tremolite asbestos [4] to measure the anisotropy of the electrical properties along the longitudinal and transverse directions. The frequency variations of the dielectric constant, dielectric loss, a.c. conductivity and d.c. conductivity have been measured. The present note reports the results of this investigation.

The same specimen of fibrous tremolite [4] was also selected for the present study. Samples were prepared by carefully packing the fibres parallel to each other to form flat bundles which were cut to suitable sizes with a microtome knife. The samples were then hot-pressed under a pressure of about 3.5×10^8 N m^{-2} to maximum compaction in order to avoid moisture and air gaps. Small pellets of two different forms were thus prepared and the end faces silver painted for measurement along the two directions (Figs. 1a and b).

The dielectric measurements were carried out on a precision capacitance bridge GR 716 in the frequency range 10^2 to 10^5 Hz by applying the resonance curve method [5]. Temperature variations of d.c. conductivities along the longitudinal and transverse directions were measured by adopting a method similar to that of Bhuniya [6].

Results are illustrated in Figs. 2 to 5. Figs. 2 and 3 show that the variation of the dielectric constant (K) follows more or less the same pattern, but the values of K at all frequencies are much higher in the longitudinal than in the transverse direction. Both the curves flatten out to almost the same values beyond 10^4 Hz showing that the anisotropy of the dielectric constant practically disappears in this higher frequency range. The

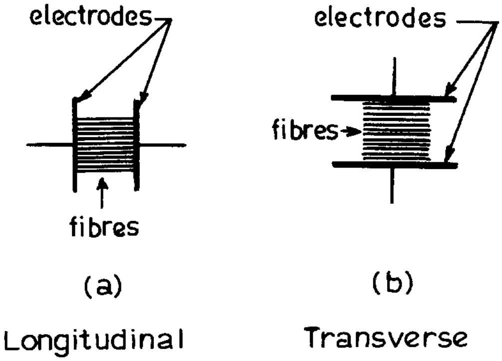

Figure 1 (a) and (b). Direction of measurement of the samples.

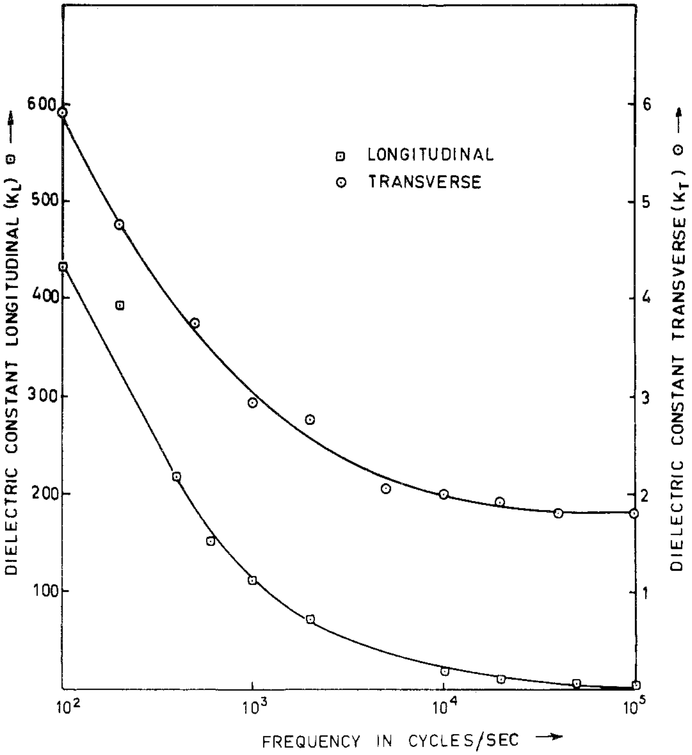

Figure 2 Variation of dielectric constant with frequency along the two directions.

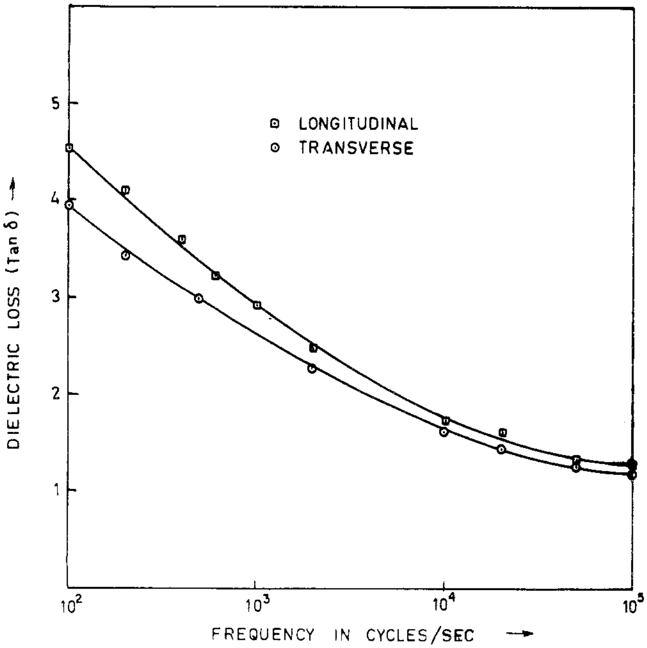

Figure 3 Variation of dielectric loss with frequency along the two directions.

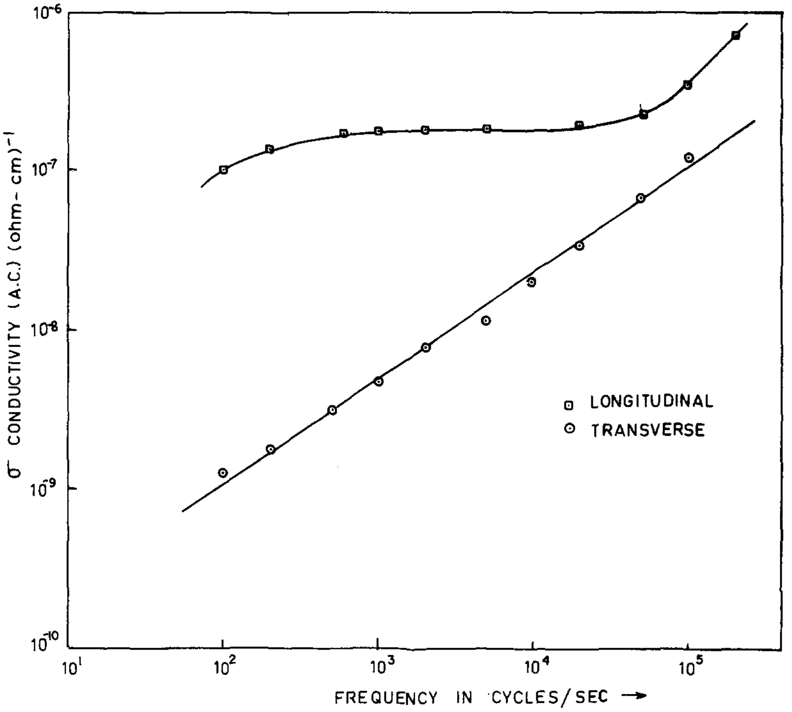

Figure 4 Variation of a.c. conductivity with frequency along the two directions.

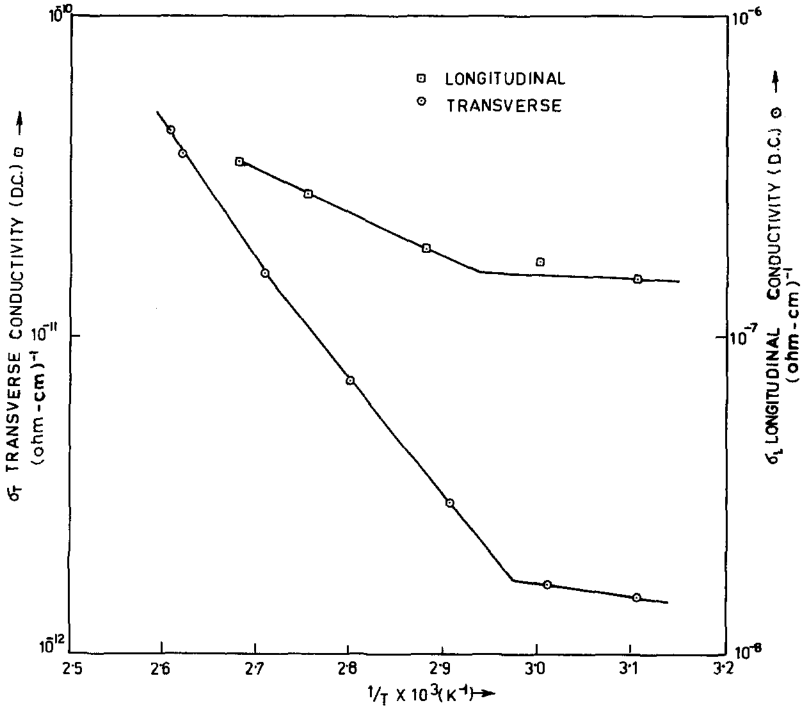

Figure 5 Variation of d.c. conductivity with inverse of temperature along the two directions.

anisotropy in the lower frequency range is due to the difference in the mobility of the free ions and the consequent space charge polarization in the two directions. Single chain silicate minerals also exhibit similar behaviour [1].

Frequency variations of the a.c. conductivities are also similar, with minor difference in the intermediate range (Fig. 4). These may be due to the presence of traces of moisture.

Fig. 5 shows that the d.c. conductivities at different temperatures along the longitudinal direction are much higher than the conductivities in the transverse direction at the corresponding temperatures. The relatively high conductivity in the longitudinal direction and low in the transverse direction is due mainly to the regularity of structure along the axial direction and disorder in the plane perpendicular to the axis of the fibre. The high conductivity in the axial direction may probably be explained in the same way as in ionic superconductors by attributing the increased conductivity to high mobility of ions in the interchain position, similar to the Na^+ in the interlayer position in β-alumina [6]. Another interesting point to note is that the d.c. conductivities around 35° C in both the directions are of the same order as the corresponding a.c. conductivities at lower frequencies, which leads us to believe that the carriers in both cases are the same.

Acknowledgement

The authors express their sincere thanks to Professor K. V. Rao and Dr R. Bhuniya for providing the experimental facilities and many helpful discussions. Thanks are also due to Mr A. Subramaniyan for his co-operation in taking the dielectric measurements. The authors also like to record their grateful thanks to Professor G. B. Mitra of the Department of Physics for his encouragement and interest in the work.

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Received 16 September
and accepted 16 December 1977.

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Oriented growth of CoO on Co_3O_4

As part of the study of the elementary mechanisms of the thermal decomposition: $Co_3O_4 \rightarrow 3\ CoO + 1/2\ O_2$ (the interest of which relates to the wide industrial use of Co_3O_4-based catalysts) the orientation relationships between the crystal lattices of both solid phases were investigated.

So far, Colaïtis *et al.* have investigated the low temperature oxidation of finely divided CoO and reported orientation relationships depending on particle size [1].

Octahedral monocrystals (edge 2 mm) were grown by chemical transport in HCl [2]. A silica tube (200 mm long, 8 mm in diameter) containing 10 mg of Co_3O_4 (Johnson Matthey 99.998%) and a few drops of fuming HCl, was cooled in liquid nitrogen, pumped out, sealed and placed in a temperature gradient (850 to 900° C) for a week. Note that using iodine as the transport agent gave much less satisfactory results (small and poorly formed crystals) while the flux method with KCl or Na_2WO_4 yielded aggregates of tiny octahedral crystals.

The decomposition conditions were determined by the thermodynamics and kinetics of the reaction and by the requirement of a low decomposition temperature in order to reduce the oxygen