I thank Prof. C. W. Allen of the University of London Observatory for permission to use the 24-in. reflector during this work.

K. FEA

Department of Physics,
University College, London.

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GEOCHEMISTRY

Increasing the Settling Rate of Flocculated Suspensions

THERE is a wide range of fields in which sonic, ultrasonic or pulsatory techniques have been found to improve the performance of a transfer process. In liquid–liquid extraction processes, for example, the effect of pulsation has been shown to increase the capacity of a unit by as much as 200 per cent[1–3]. Mass transfer rates and the coefficient of heat transfer are also claimed to be improved by sonic vibrations[4–6].

These results suggest that vibrations might improve the performance of other processes. It is well known, for example, that the sedimentation rate of fine particles suspended in liquids can often be increased by the addition of a flocculating agent but, so far as we are aware, the influence of vibration on the settling rate of such suspensions has not been explored.

As part of a general programme dealing with the rheology of suspensions the effects of mechanical vibration at 50 c.p.s. on the settling rate of aqueous suspensions of polyvinyl chloride spheres (possessing a maximum diameter of 1 micron) and a kaolin china clay are being examined. When these are flocculated with potassium alum solution they develop definite yield stresses. The sedimentation tests are carried out in cylindrical tubes of 3 cm internal diameter and 60 cm in height, under static and vibrated conditions. Typical results for polyvinyl chloride spheres at a volume concentration of 15·8 per cent and for kaolin at a volume concentration of 3·5 per cent are shown in Fig. 1. The differences in the sedimentation curves are quite pronounced, showing increases in the settling rate, with the vibration, of at least 200 per cent.

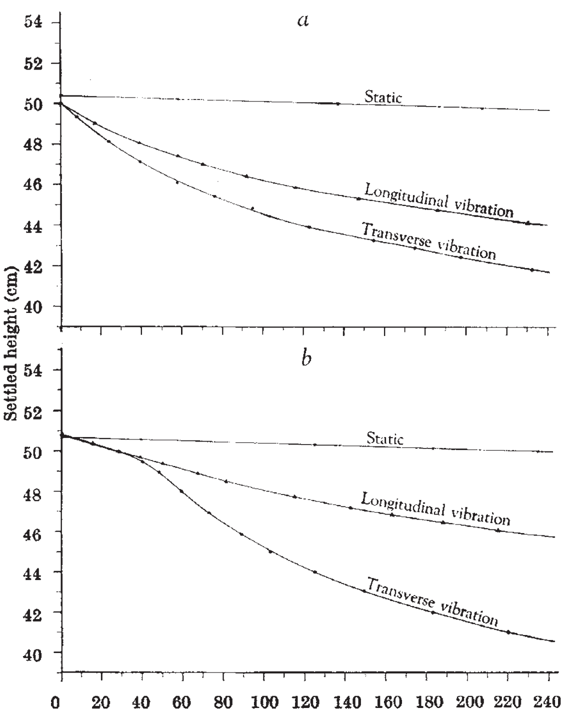

Fig. 1. Sedimentation under static and vibrated conditions. *a*, Polyvinyl chloride spheres; *b*, kaolin

Although longitudinal and transverse vibrations both give improved settling rates compared with static conditions, it appears that the greatest improvement is obtained with transverse vibrations. Amplitude variations have very significant effects, particularly in the initial stages of settling, and the tube diameter may in some cases be important. The mechanism involved is at present under investigation and a more detailed report of the work will be published in the near future.

E. K. OBIAKOR
R. L. WHITMORE

Department of Mining Engineering,
University of Nottingham.

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MINERALOGY

Interlamellar Sorption in a 'Methylated' Montmorillonite

As a sequel to the work already carried out on interlamellar sorption of organic molecules on methylated graphitic acid[1] and on the structure of methylated graphitic acid by electron diffraction[2], I decided to try to methylate montmorillonite, and to examine its capacity for interlamellar sorption. The problem of methylating montmorillonite has been discussed a good deal, and many arguments for and against have been put forward, and have been linked with the two structural models for montmorillonite.

A Wyoming montmorillonite was used in this work. It was acidified by the method described by Girod and Lacroix[3].

The H^+ montmorillonite, once prepared, was dried at 110° C for 12 h and methylated, following Vogel's method[4]. The methylated product was washed several times with ether, then dried *in vacuo* in a desiccator with P_2O_5.

The basal spacing obtained was 12·35 Å, and remained constant after treatment with numerous organic substances, both polar (amines, alcohols, water) and non-polar (paraffins, toluene).

However, on heating the methylated sample in a capillary to 110° C and 130° C for 48 h, the layers become disordered, and the basal spacing diminishes by 1 Å (the disorder is indicated by a spreading of the basal spacing reflexion). These heated samples recover the basal spacing if treated with octylamine, but no higher spacing than 12·35 Å appears.

It is to be noted that original montmorillonite gives high spacings with aliphatic amines, in accordance with the observations of Aragón, Cano-Ruiz and MacEwan[5], and Armin Weiss[6]. After 'methylation', the montmorillonite fails to react. This result does not agree with those of Brown, Greene-Kelly and Norrish[7], or that of Greenland and Russell[8]. Methylation was carried out until no reaction of the diazomethane with the clay was observed, only a slight bubbling corresponding to the diazomethane itself—in contrast to the intense bubbling of the first days.