SOIL SCIENCE

Optical Microscopy and Soil Structure

USE of a photometer in conjunction with a polarizing microscope has yielded useful information regarding the structural anisotropy of soil mechanics test specimens.

Kaolin was thoroughly remoulded at 100 per cent moisture content and divided to form three specimens. One specimen was consolidated in a shear box to 4 kg/cm², allowed to rebound to 2 kg/cm², sheared at 1 mm/min and finally unloaded completely. For the second specimen shearing was omitted. The third specimen was left in the remoulded unconsolidated state.

Using a cheese wire, undisturbed samples were cut from the sheared and from the consolidated specimens. Samples were taken from the unconsolidated specimen with a spatula. After impregnation with 'Carbowax 6000', without an intermediate drying stage, thin sections were prepared by grinding and polishing.

Between crossed-polars the thin sections showed a mottled appearance. Fig. 1 is typical. The shades of the light and dark patches changed as the angle between section and polars was altered. A parallel electron-microscopical examination suggested that each patch is a domain of almost parallel particles.

For microphotometry, an auxiliary lens, mounted above the microscope eyepiece, imaged the section in the plane of a variable iris diaphragm. Light passing through the diaphragm was filtered to 5420 Å wave-length, and collected by a photocathode. An auxiliary viewing system made possible both visual control of the measurements and calibration of the diaphragm setting.

The polar diagram (Fig. 2*a*) illustrates a series of measurements made on a circular area of 0·1 mm diameter. The intensity of light transmitted by this area (I) was measured as a function of angle while thin section and microscope stage were rotated together. In the diagram the intensity is plotted as radius at the corresponding angle. The symmetrical four-lobed figure is as might be expected from an anisotropic area.

An anisotropy index (A) has been defined as:

$$A = \frac{I_{max} - I_{min}}{I_{max} + I_{min}}$$

Fig. 2*b* shows the dependence of anisotropy index on radius of area of measurement for observations made on three series of concentric circles. The locations of the observations were judged by visual examination to be typical of the specimens in the unconsolidated and in the consolidated cases. Increases of anisotropy due to consolidation and to shear are in accordance with observations made elsewhere[1–8] and with preliminary electron microscopical observations made on other samples of these specimens.

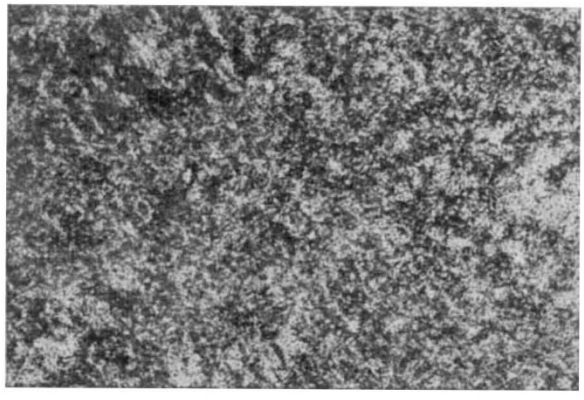

Fig. 1. Remoulded kaolin between crossed-polars. (× *c.* 100)

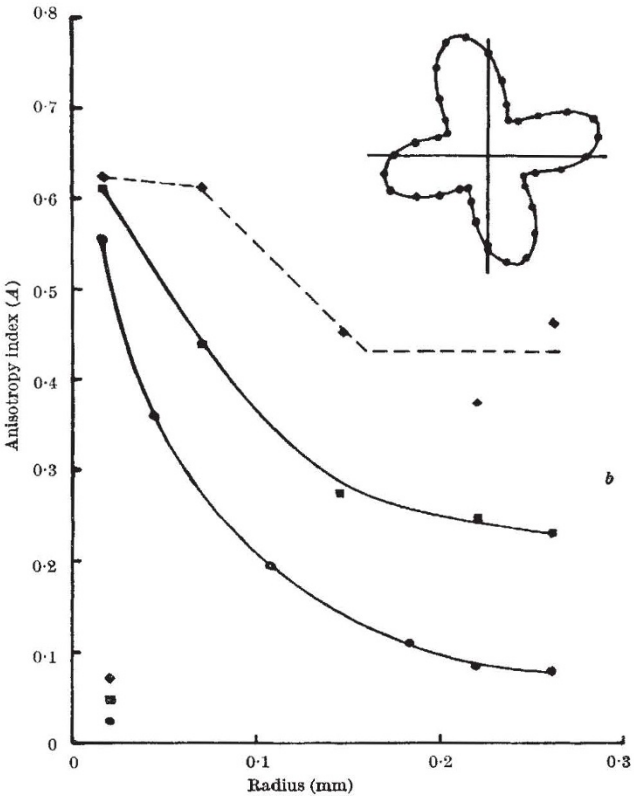

Fig. 2. (*a*) Polar diagram: intensity of light transmitted: inclination of polarizing system. (*b*) Anisotropy index: radius. ●, Unconsolidated; ■, uniaxial consolidation; ◆, sheared

In any interpretation of the results, the nature of the optical phenomena involved, the statistical variation inherent in the specimens, and the thickness of the sections studied must all be considered.

The results available are of sufficient extent only to illustrate the methods. I thank Ernst Leitz *G.m.b.h.*, the Soil Mechanics Laboratory of the Department of Engineering, University of Cambridge, and the Nuffield Foundation for their assistance.

PETER SMART

Department of Engineering,
University of Cambridge.

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GENERAL

Giorgi: a Proposed New Name for the Kilogramme

THE rapidly increasing acceptance of S.I. units by physicists, other than nuclear physicists, by chemists, by electrical engineers, and by mechanical engineers has led to the expression in several quarters of the desirability of a single symbol and a simple name to replace the kilogramme. I suggest the symbol G and the name Giorgi. The reasons for this are obvious.

E. A. GUGGENHEIM

Department of Chemistry,
University of Reading.