where K is a constant. The net transmitted power flow is associated with the first term inside the bracket and the velocity of propagation of this energy is c. If, however, this transmitted power is inherently guided by the stored energy component associated with the second term in the bracket, then it is the Sun's gravitational interaction with this stored energy term which is relevant to determining the deflexion of a light beam. The root-mean-square velocity, along the radius vector, associated with this stored energy term is simply $c/\sqrt{2}$ and the deflexion of a light beam is then:

$$\theta = \frac{4M}{a}$$

the same result as is predicted by general relativity.

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Epitaxial Deposition of Cadmium Selenide

In the past few years there has been considerable interest in the use of evaporated films of cadmium selenide (CdSe) for thin-film transistors and photoconductive devices[1]. As normally prepared, such films consist of polycrystalline material which has a rather poor electron mobility.

We have found that it is possible to produce large-area single-crystal films of cadmium selenide in a conventional evaporator by using mica as an orientating substrate.

Photoconductive grade cadmium selenide is evaporated from an alumina boat on to freshly cleaved mica in an ambient pressure of 10^{-5}–10^{-4} torr. The mica substrate is mounted in an almost enclosed oven to give a uniform substrate temperature, and the cadmium selenide film thickness is monitored by optical reflexion through the substrate. Initial nucleation is performed at a temperature of 200° C, and evaporation is continued until the reflectivity has increased by about 20 per cent. The evaporation is then interrupted, the substrate temperature raised to 400° C, and the evaporation completed. Deposition rates of 100–150 Å/min are used at this latter stage, and the films built up to a total thickness of 750–3000 Å. Thicker films than this tend to flake off the substrate.

To illustrate the single-crystal nature of the films, Fig. 1 shows a transmission electron diffraction pattern of a 750 Å film. The whole area of the film produced (1·8 cm diam.) is single-crystal.

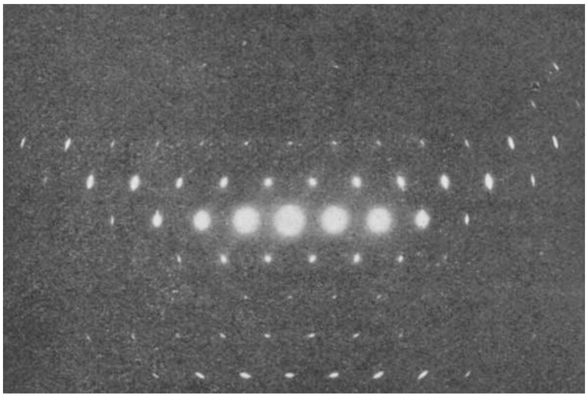

Fig. 1. Transmission electron diffraction pattern of a film of cadmium selenide

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Fluid Displacement Phenomena in Porous Media observed by a Wide-line Nuclear Magnetic Resonance Method

Laboratory investigations of fluids moving through porous materials have been handicapped by the lack of direct methods of measuring fluid content without disturbing flow. Investigations of flow in porous media have been dependent on the properties of the particular tracer used to follow the flow. Experiments using labelled fluid have been criticized on the grounds that the movement of the tracer may not completely reflect the movement of the fluid.

The problem of measuring fluid content in porous materials has been studied extensively, however, and several methods have been developed through the use of various techniques, including electrical resistivity, X-ray absorption, radioactive tracers, neutron diffraction, magnetic susceptibility, and γ-ray absorption.

A new experimental method, based on nuclear magnetic resonance principles, which is free from the inherent limitations of the foregoing methods, was developed for examination of flow of fluids through porous media[1,2]. The sample to be investigated is placed within a coil and the amount of hydrogen-containing liquid is obtained directly by measuring the number of hydrogen atoms present inside this coil. No additional tracer is needed, since each hydrogen nucleus acts as its own tracer.

This method depends on the observation that if a sample containing nuclei with spin quantum number other than zero is placed in a direct-current magnetic field and is simultaneously irradiated by a small radio-frequency field rotating in a plane perpendicular to the steady magnetic field, the nuclei absorb radio-frequency energy at unique resonant frequencies proportional to the magnetic field strength[3]. The amount of energy absorbed by a liquid sample containing hydrogen atoms in its chemical constitution (such as water or hydrocarbon) is a measure of the number of hydrogen atoms in the observed volume.

In situ determination of fluid saturations in a miscible displacement experiment was performed for the first time without addition of a tracer through use of the nuclear magnetic resonance apparatus[1,2] and has already been reported[4]. This communication presents the results of detailed investigations of several miscible and immiscible displacement experiments conducted by displacing distilled water with deuterium oxide, kerosene with carbon tetrachloride and with deuterium oxide, and n-heptane with carbon tetrachloride in the presence of residual deuterium oxide in Boise sandstone cores.

The nuclear magnetic resonance spectrometer developed for use in investigations of flow through porous media is described by Timur *et al.*[1], and the details of the experimental arrangement of the nuclear magnetic resonance apparatus are given in ref. 2. The sandstone flow samples used in the experiments were prepared by encapsulating Boise sandstone (permeability, 1·7 darcies; porosity, 26 per cent) cores of 3/4 in. diameter and 6 in. length in a heat-shrunk plastic tube which also held brass plugs to each end so that fluids could be flowed through the sandstone.

A sandstone sample, saturated with a hydrogen-containing liquid by the usual procedure of evacuating the pore space and then allowing the liquid to enter, was placed vertically inside the sample coil (1 in. length and