time) than the core. The situation is somewhat akin to a composite charge composed of cylinders of different detonation velocities. The detonation velocity is then always that of the component with the highest detonation velocity, and whether the high-velocity component is on the outside or the inside it will still be the rate-determining factor for the charge as a whole. In the case of confined charges, the finely crystalline surface-chilled layer is probably very thin, and the effect produced, therefore, may be of an intermediate character; but it will be out of all proportion to its size because it is the high-velocity component.

The dependence of reaction-time on grain-size in the case of cast explosives has an important bearing on the various theories put forward to account for the initiation of the decomposition at the detonation front. It is in accord with the hypothesis of heterogeneous explosive decomposition involving a reaction between a gaseous and a solid phase, the major part of the reaction involving the erosion of the crystallites by the hot gases arising from the already decomposed explosive.

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W. M. EVANS
Department of Atomic Energy.
T. C. TRANTER
Wool Industries Research Association,
Torridon, Headingley, Leeds.
Aug. 18.

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Oxidation Changes in Natural Ilmenite

NAGATA has discussed the occurrence of three magnetic components of the Haruna and Asio rocks exhibiting thermo-remanent reversals[1]. The properties of the B-component appear to be very similar to those of a material recently examined in this laboratory. We have been investigating the impure ilmenite concentrate obtained as a by-product in the winning of rutile from beach sands on the east coast of Australia.

This concentrate may be refined magnetically to produce a highly magnetic fraction (containing magnetite and other highly magnetic materials and comprising about 2 per cent by weight of the total concentrate) together with fractions of weakly ferromagnetic material closely related to ilmenite which have volume magnetic susceptibility in the range $0{\cdot}4 \times 10^{-3}$ to $1{\cdot}1 \times 10^{-3}$ C.G.S.U. at low magnetizing fields. This variation in susceptibility is associated with a variation in apparent ferric to ferrous iron ratio, the range being 0·40–0·65, while the titanium (TiO_2) content is within the range (50 ± 2) weight per cent. Manganese is present to about 2 per cent by weight.

When any magnetic fraction of this 'ilmenite' is heated in air at a temperature in excess of 600° and below 800° C., an oxidation process occurs during which the apparent ferric to ferrous iron ratio rises to approximately 1·3 and, on cooling, the material shows much enhanced magnetic properties. The value of the initial susceptibility for a sample of firmly packed grains is approximately 2×10^{-2} C.G.S.U., about one-fifth of that for a similar sample of natural magnetite.

Observations have been made of the crystal structure and magnetic properties of this 'magnetic ilmenite' derived from different magnetic fractions of the original ilmenite, and no significant variation has been noted. Debye–Scherrer X-ray photographs were made for a particular fraction of the ilmenite and for the 'magnetic ilmenite' derived from this fraction, and these were compared. The pattern due to 'magnetic ilmenite' may be described as the superposition of a set of lines which were indistinguishable from the lines of the original fraction and of lines due to rutile. No difference has yet been noted by mineragraphic examination of the two sets of grains.

The Curie point of the 'magnetic ilmenite' is between 100° and 200° C., and the dependence on temperature of the magnetic properties is otherwise consistent with that for Nagata's B-component[1b].

Qualitative tests show that crystals of Norwegian ilmenite may similarly be changed to 'magnetic ilmenite', but the necessary temperature and time of heating will depend on the size of the crystals.

Prolonged roasting of the natural ilmenite at temperatures in excess of 800° C. results in the conversion of the iron to the ferric form. The final product is weakly ferromagnetic, and at low magnetizing fields the volume magnetic susceptibility is about $0{\cdot}3 \times 10^{-3}$ C.G.S.U. The Debye–Scherrer X-ray pattern may be resolved into a set of rutile lines and a set of lines due to a tetragonal crystal with lattice parameters $a = 4{\cdot}861$ A., $c = 6{\cdot}625$ A., $c/a = 1{\cdot}363$.

This investigation has been carried out in the J. I. Carroll Research Laboratory of this School and we wish to acknowledge the guidance of Prof. C. J. Milner.

C. E. CURNOW
L. G. PARRY
School of Applied Physics,
New South Wales University of Technology,
Sydney.
Aug. 20.

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Flow Potentials in Hyaluronate Solutions

RECENTLY, it was found in this Institute[1] that solutions of potassium hyaluronate give elastic recoil when examined in a glass capillary by the 'œstroscope' technique[2]. This was ascribed to the long, flexible hyaluronate ions, which presumably form a lace-work all through the solution, knitted together by hydrogen-bond cross-links and adhering to the glass wall. The potassium ions are obviously more free to move, but in flowing, as soon as they tend to run in advance of the negatively charged hyaluronate polyions, a potential must arise to preserve electroneutrality.

In connexion with another recent finding in this Institute, that the endolymph of the inner ear in sharks contains a fair amount of hyaluronic acid[3], the possible occurrence of such flow potentials in hyaluronate solutions opened up an interesting possibility to account for the microphonic potentials detected in the inner ear by Wever and Bray[4] and thereby also to contribute to our understanding of the mechanism of perception in the inner ear.

To test the actual occurrence of such potentials we made a primitive model. From a screened capillary