in the single phase region rises rapidly to a value of 37 microhm-cm for a ruthenium content of approximately 12 per cent, further ruthenium additions reducing the resistivity of the duplex alloys in a perfectly linear manner. The position of maximum resistivity confirms the position of the phase boundary shown in Fig. 1.

Hardness Values

The hardest alloys of this series are those containing approximately 90 per cent of ruthenium. Fig. 12 illustrates the hardness values of alloys quenched from 700, 850 and 1500°C. Characteristic features common to all these curves are the hardness peak reaching a maximum at 90 per cent ruthenium and the curious plateau extending over much of the duplex region. The high hardness of alloys containing 80 to 90 per cent of ruthenium aged at 850°C for seven days might be attributed to the slow decomposition of the supersaturated ruthenium-rich solid solution.

Discussion

The results of this investigation have been plotted to give the diagram shown in Fig. 1. The liquidus data of Rudnitskii and Polyakova are in fairly good agreement with the general shape of the diagram, but some accurate melting point determinations towards the ruthenium-rich end of the diagram are obviously required. The recent determination of Baird (3) for the melting point of ruthenium, 2250°C, has been accepted in drawing the liquidus.

Detailed study of the ruthenium-rich solid solutions is desirable in view of the possibility of allotropic modifications in this element at temperatures above 1500°C.

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Powerforming in the Esso Refinery at Cologne

The new £18 million oil refinery recently put on stream by Esso A.G., Cologne, represents a major addition to German oil refining capacity. Situated near the Ruhr where the principal consumers of fuel oils are concentrated, a range of fuel oils will form over 50 per cent of the plant's annual capacity of 3.5 million metric tons. Diesel fuels will constitute about 25 per cent of output, the remainder being high-octane petrol and raw materials for a variety of petrochemical processes.

Production within the refinery is based on an Aramco feed stock having a research octane number from 25 to 45 and a boiling range from 160 to 400°F. To achieve a substantial up-grading and to yield fuel of research octane numbers exceeding 100, a Powerforming plant of 9000 B/SD capacity is installed.

Powerforming, developed in 1954 by the Esso Research and Engineering Co., New York, is a fixed-bed catalytic reforming process employing a platinum catalyst.

The principal reactions within the Powerformer are the dehydrogenation and dehydroisomerisation of feed stock naphthenes, together with dehydrocyclisation of paraffins. Undesirable hydrocracking is kept to a minimum. Four reactors in series with intermediate reheat furnaces are in operation, together with a swing reactor which enables each catalyst charge to be regenerated without loss of production.