value of <0.5 per cent. Short duration power dissipation tests showed no drift in value at loadings of up to 100W/in^2/mil. The films showed good thermal stability with a drift of <0.5 per cent after ten cycles from +20° to 105°C, and a drift of <0.25 per cent after 2000 hours at 105°C without load.

Application to the Substrate

The organic medium in which the solid components are dispersed was formulated to give a paste with rheological properties suitable for screen printing. This process, with close control, allows deposition of even, well defined films ranging in thickness, when fired, from 0.002 to 0.0003 inch, largely depending on the design of the machine, the mesh size of the screen and the type of stencils used. Printing thickness was standardised at 0.0005 inch, using a 200 mesh stainless steel screen. This was considered suitable for all circuits except those in which unusually high power dissipation is necessary, when films up to 0.001 inch might be preferred.

The surface condition of the substrate was found to have an effect on the reproducibility of electrical properties of the fired films. The best results were obtained with smooth flat substrates such as mica, glass and high quality alumina ceramics, with centre line average values of smoothness below 5μ inch.

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Cobalt-Platinum Alloy Magnets

TEMPERATURE DEPENDENCE OF MAGNETIC PROPERTIES

Recent studies of cobalt-platinum alloys have shown the importance of crystal structure in relation to the exceptional magnetic properties which can be developed, particularly in the 50 atomic per cent alloy.

In work reported by Dr Hermann Dietrich of the Research Institute of Deutsche Edelstahlwerke, Krefeld, and reviewed in this journal (1), it was shown how the magnetic state of cobalt-platinum magnets was altered by heating to temperatures near the Curie point. More recently, the same author has reported the results of a further study of the temperature dependence of various cobalt-based permanent magnets, including cobalt-platinum, in which temperature coefficients of saturation magnetisation and demagnetisation curves were determined (2).

From the results of tests on small cylindrical cobalt-platinum magnets produced from melted and cast material, it was shown that variations in saturation magnetisation were small between −200°C and +200°C. Within this range the average saturation magnetisation was found to be 6750 gauss and this varied with temperature at the rate of −0.01 per cent per °C. A single Curie temperature was found at 530°C, despite the presence of a two-phase structure, indicating either that one phase only is ferro-magnetic or that the ordered and disordered phases have similar Curie temperatures.

Demagnetisation curves, shown as the relationship between intrinsic induction ($4\pi I$) and demagnetising field (H) at temperatures between −195° and 440°C, demonstrate the very high coercivity of the cobalt-platinum alloy. The 'rectangular' form of the curves in the lower temperature ranges indicates high stability under large demagnetising fields of at least 2000 oersteds, and while residual induction reduces more rapidly with increasing temperature, those magnets with a suitably high length : diameter ratio exhibit almost negligible temperature dependence between −195° and +200°C. Above 200°C the magnetic properties reduce rather more rapidly, but can still be restored by remagnetising until changes in structure, which start to occur at about 500°C, produce permanent changes in the demagnetisation curve.

L. A. F.

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