ABSTRACTS OF PAPERS
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Effect of Aging on the Maximum Permeability in Quenched Fe-Al Alloys (Alperm)*

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Abstract

"Alperm" is a high permeability iron-aluminium alloy containing 10 to 17 percent aluminium, which was discovered by Dr. H. Masumoto and the present author in 1939 (1), and at present, the alloy containing 16 percent aluminium is widely used. The alloy is called Alfenol 16 in U.S.A., Vacodur 16 in Germany and IU 16 in U.S.S.R.

There is some belief that Alperm shows magnetic aging, resulting in a decrease of permeability, which is believed to happen after quenching. To confirm whether there is any aging effect or not in Alperm, the present author measured the change of magnetic properties in various Alperm alloys over a period of more than 2 years after quenching.

The specimens used are rings, 60 mm in outer diameter, 46 mm in inner diameter, and 0.5 mm thick, which were cut out from plates of iron-aluminium alloys containing 13.9, 14.7 and 15.1 percent aluminium. The specimens were heated at 1000°C for 1 hour in vacuum, cooled in the furnace to 600°C in the case of 13.9 percent aluminium alloy and to 570°C in the case of 14.7 and 15.1 percent aluminium alloys, and then quenched in oil after being kept at the above temperatures for 10 minutes. Four or five specimens of each alloy were stacked, and a magnetization coil and a search coil were wound on the stacks after they were covered by thin insulation tape. The measurements were made by the ballistic galvanometer method.

According to results of the measurements, it was found that there is no time change in the maximum permeability ($\mu_m$) in the alloy containing 13.9 percent of aluminium, but for alloys containing 14.7 and 15.1 percent of aluminium, $\mu_m$ increases with time after quenching and reaches a finite value, the increase being larger for the latter alloy.

These changes of $\mu_m$ may be caused by the relief of the elastic stress which was introduced by stacking ring specimens with plate surfaces curved slightly by quenching.

From the results mentioned above, we may conclude that very little or no magnetic aging exists in Alperm. But even if the change of permeability mentioned above might be due to the aging, it is clear that the aging increases the permeability, which is rather favourable to the application.

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