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## The Effect of Plastic Deformation on the Coercive Force and Initial Permeability of Nickel Single Crystals\*

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### Abstract

In order to study the effect of plastic deformation on the magnetic properties of ferromagnetic materials, the initial permeability and coercive force of nickel single crystals stretched stepwise up to 50% in shear strain have been measured, by means of the ballistic method at various temperatures ranging from  $-196^{\circ}\text{C}$  to  $200^{\circ}\text{C}$ . It has been found that the initial permeability shows a minimum, while the coercive force reveals a maximum near room temperature and this peak moves toward the lower temperature with increasing strain. The application of our theory developed in the preceding paper to these experimental results shows that the dislocation density,  $N$ , calculated from the observed values of the coercive force is connected with the shear stress,  $\tau$ , by the following relations

$$\begin{aligned}\tau - \tau_0 &\sim N && \text{in stage I,} \\ \tau - \tau_0 &\sim N^{1/2} && \text{in stage II and III,}\end{aligned}$$

where  $\tau_0$  is the critical shear stress. Further, for explaining the change in initial permeability with plastic deformation, the flexibility of the domain walls is discussed.

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