Hysteresis And Magnetoelastic Domain Wall Behavior of Two

JACOB HOBERG, JASON ORRIS, GREGORY SOLLENBERGER, DOUG
FRANKLIN, MARK BOLEY, Western Illinois University — We have produced
torque sensors from type A-2 and type H-13 tool steels for torque transfer appli-
cations in a 0.75 inch outer diameter hollow shaft by magnetically polarizing two
adjacent sections with oppositely directed circumferential magnetization. The re-
sultant field signal, found to be linear with applied torque up to 15 N-m, emanated
from the domain wall formed between the two regions. Heat treatment resulted in
an increase in torque-load sensitivity (field signal in $\mu$G per unit applied shear stress
in psi) from 48.2 $\mu$G/psi to 59.2 $\mu$G/psi in the A-2 sample and from 125 $\mu$G/psi to
189 $\mu$G/psi in the H-13 sample, improved linearity of the signals, and a more reliable
re-zeroing of the sensors following removal of the applied torque. The axial coercive
forces were found to decrease prior and subsequent to heat treatment, with the per-
cent of decrease in correlation to the percent of increase in the sensitivities found
above, while the circumferential coercive forces were sufficiently large to guarantee
integrity of the magnetically polarized regions comprising the sensor. The width
and magnetic intensity of the domain wall in each sensor were also measured using
the technique of magnetic force microscopy.

Doug Franklin
Western Illinois University

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