MAGNETOSTR1CTION OF POLYCRYSTALLINE Tb-Dy AT CRYOGENIC TEMPERATURES

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At cryogenic temperatures, Tb-Dy alloys exhibit “giant magnetostriction", which makes these materials interesting for engineering service in cryogenic actuators, valves, and posit ioners. Saturation magnetostrictions approach ing 1 % are achieved for single crystals, but the preparation of single crystals is difficult, and will likely remain so. We **have been developing textured polycrystalline materials that** retain some fraction of the single crystal magnetostriction. To date (June 1997), polycrystalline $Tb_{.76}Dy_{.24}$, cold rolled to induce crystallographic texture, has shown magnetostrictions at 77 K which are a significant fraction of those obtained for single crystals. We are actively exploring the parameter space of annealing temperature and rolling texture, and our most recent results will be presented at the meeting. Even with a fraction of the single crystal performance, however, the polycrystalline samples show two major advantages. They are easy to prepare, and large samples can be prepared at low cost. Second, we have found that polycrystalline Tb-Dy alloys do not require an applied stress in order to return to their original unstrained state, The microstructural origin of this “internal spring” is under investigation, but we expect it is related to elastic interactions between neighboring crystallite. The use of this internal spring simplifies the engineering design of devices such as heat switches.