4/9/90

The Effect of Various Steels on B0/D0 Dipoles

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Over the years B0/D0 dipoles have been made from steels with a large variation in coercive force. The newest magnets using "new Armco" steel have coercive force of 0.75. The surplus Tev I steel used in some of the earliest magnets had coercive force over 2.5. Using the MTF magnetic field data from production measurements, I've attempted to investigate the effect of varying the coercive force.

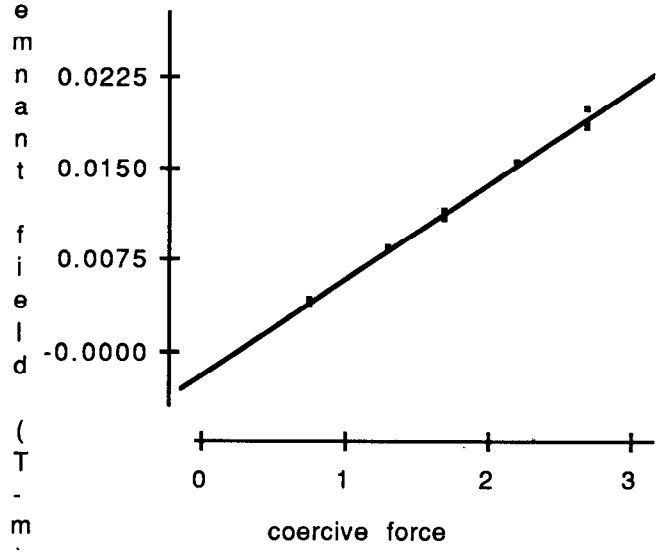
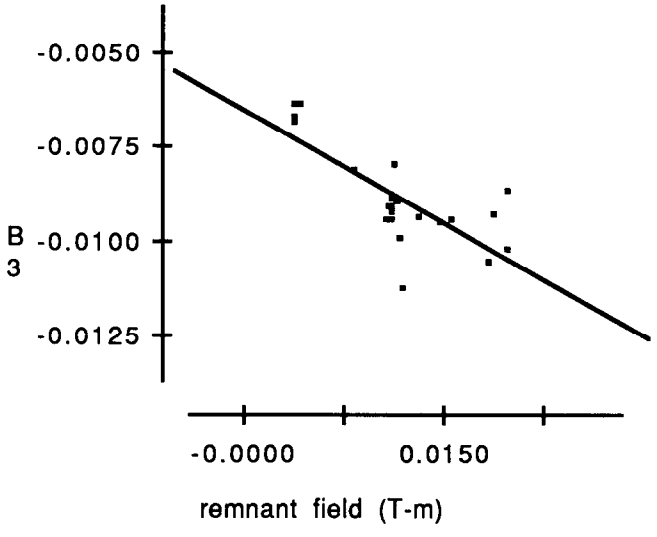
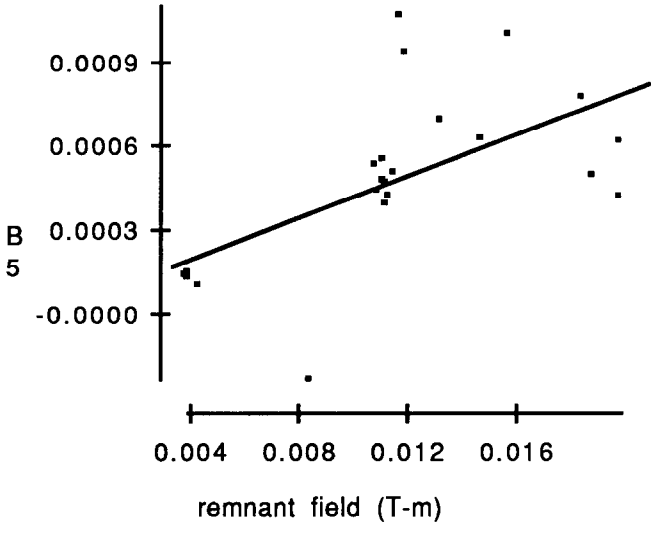
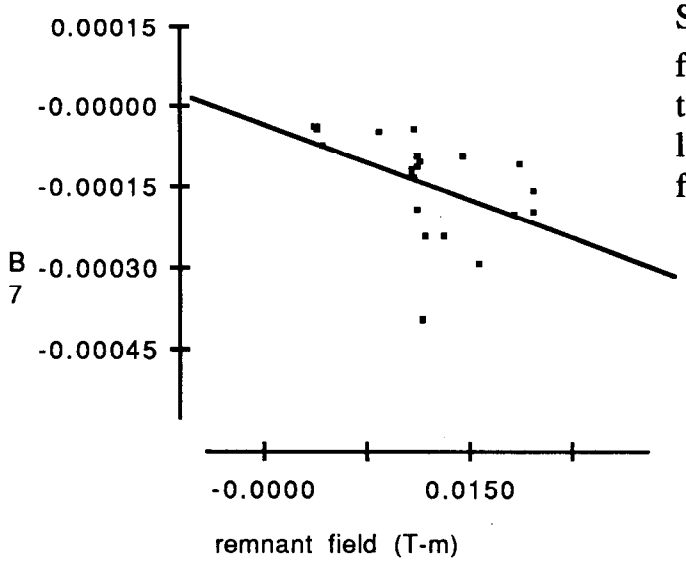


Figure 1 shows the variation of the remnant magnetic field integral vs. the coercive force for the steel the magnet was made from. The line is a fit to the data. Several of the early magnets were made of mixtures of "old Armco" and Tev I steel with unknown ratio. To include these in further analysis, I look at the relation between the relative multipole moment and the remnant field. There is a clear increase of b_3, b_5, and b_7 with higher remnant field.







Since the b_i are ratios of multipole field to the (remnant) dipole field, in these magnets these multipoles grow like the second power of coercive force.