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Upper Critical Fields in Nb/Ni Bilayers EMILY DAVIS, TIM AHRENHOLZ, PHILLIP BROUSSARD, Covenant College, Lookout Mtn, GA 30750 — We studied the upper critical fields (H_{c2}) of Nb/Ni bilayers. These bilayers had a constant Nb thickness of 33 nm, and the Ni thicknesses varied from 0-7 nm. For each sample, we took resistive measurements of the superconducting transition under fields ranging from 0-4360 G. From these measurements, we obtained the upper critical field slopes (H'_{c2}) of each sample. The H'_{c2} of a simple Nb layer was 3710 G/K, while the H'_{c2} values for the bilayers ranged randomly from 4650-6840 G/K. While the critical temperatures (T_c) of the samples seemed to exhibit a particular non-monotonic pattern as a function of Ni thickness (due to proximity effect), the H'_{c2} values as a function of Ni thickness formed no such clear pattern. We also analyzed the curvature of the H vs. T_c plots for each sample. Most of the plots were linear at lower applied fields, but many showed either positive or negative curvature as we applied higher fields. This curvature began anywhere between 2000 and 4000 G. Generally, bilayers with thinner Ni layers produced H vs. T_c plots with negative curvature, and bilayers with thicker Ni layers produced plots with positive curvature.

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