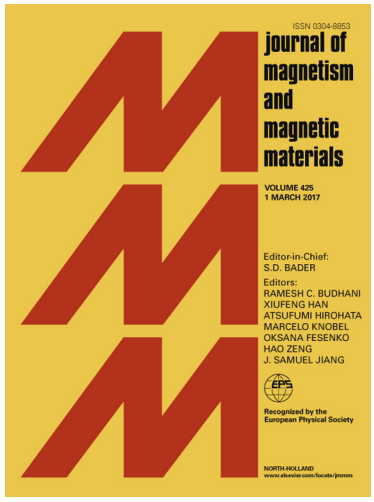

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The magnetic, electrical and structural properties of copper-Permalloy alloys

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Abstract

Copper Permalloy [$Cu_{1-x}(Ni_{80}Fe_{20})_x$] alloy films were deposited by co-sputtering and their chemical, structural, magnetic, and electrical properties were characterized. These films are found to have favorable weak ferromagnetic properties for low temperature magnetoelectronic applications. Our results show that by varying the composition, the saturation magnetization (M_s) can be tuned from 700 emu/cm^3 to 0 and the Curie temperature (T_c), can be adjusted from 900 K to 0 K. The M_s and T_c are found to scale linearly between $x = 25\%$ and 100%. Electronic structure calculations are used to provide a strong fundamental understanding of the mechanisms responsible for establishing the observed electrical and magnetic properties. The theoretical results also show that the introduction of Cu into the Permalloy lattice results in very strong spin scattering in the minority spin channel, with only moderate interactions in the majority channel.