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Enhanced tunneling spin polarization by amorphizing usually crystalline CoFe alloys without any glass forming additives LI GAO[1], XIN JIANG, SEE-HUN YANG, PHILIP M. RICE, STUART S.P. PARKIN, IBM RESEARCH DIVISION, ALMADEN RESEARCH CENTER, SAN JOSE, CA 95120, USA COLLABORATION — Ferromagnetic alloys of Co and Fe are particularly useful electrodes in magnetic tunnel junctions because they exhibit high spin polarization and high Curie temperatures as well as high thermal stability. These alloys are crystalline but they can be made amorphous by adding suitable glass-forming elements such as Boron. Here we show that films of pure CoFe alloys can be made amorphous, without the need of any additives, by sandwiching them between two amorphous layers, a tunnel barrier formed from amorphous Al_2O_3 and an amorphous overlayer. The films are amorphous when thinner than $\sim$25 Å but are crystalline for thicker layers. We find that both the tunneling magnetoresistance and the tunneling spin polarization (measured using superconducting tunneling spectroscopy in related junctions) are significantly enhanced when the alloy is amorphous. However, by heating the alloy above its glass crystallization temperature the enhancement is observed to vanish. Possible reasons for this behavior are discussed.

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