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Tunnel magnetoresistance of spin tunnel contacts to silicon. R. JANSEN, MESA+ Institute for Nanotechnology, University of Twente, B.C. MIN, R.S. PATEL, S.P. DASH, M.P. DE JONG — For the development of silicon-based spintronic devices, careful design of the contacts between ferromagnet and semiconductor is crucial, as the resistance and potential energy landscape critically affects spin flow across the interface. One approach to engineer spin tunnel contacts to Si uses low work function materials, inserted between the ferromagnet (FM) and the insulator of FM/Al2O3/Si tunnel contacts [1]. Here we present another route to tune the properties of FM/Al2O3/Si contacts by exposure of the Si surface to Alkali metal atoms, such as Cs, prior to preparation of the tunnel barrier. This is surprisingly effective in reducing the Schottky barrier height, and we will present a series of measurements that elucidate the mechanism. Moreover, we show that the band bending near the contact can be inverted, leading to the formation of a two-dimensional electron gas observable in tunneling spectroscopy, and giving rise to novel tunnel magnetoresistance. [1] B.C. Min et al. Nature Materials 5, 817 (2006).

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