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Polarized fusion, its implications, and plans for a proof-of-principle experiment at the DIII-D tokamak[1] A.M. SANDORFI, A. DEUR, M.M. LOWRY, X. WEI, Jefferson Lab, Newport News VA, D. PACE, N. EIDIETIS, A. HYATT, G.L. JACKSON, M. LANCTOT, S. SMITH, H. ST-JOHN, General Atomics, San Diego CA, G.W. MILLER, X. ZHENG, University of Virginia, Charlottesville VA, L.R. BAYLOR, Oak Ridge National Lab, Oak Ridge TN — The cross section for the primary fusion reaction in a tokamak, D+t $\rightarrow \alpha$ +n, would increase by a factor of 1.5 if the fuels were spin polarized parallel to the local field, rather than randomly oriented. Simulations show further gains in reaction rate would accompany this increase in large-scale machines such as ITER, due to increased alpha heating. The potential realization of such benefits rests on the crucial question of the survival of spin polarization for periods comparable to the energy containment time. Despite encouraging calculations, technical challenges in preparing and handling polarized materials have prevented any direct tests. Advances in three areas - polarized material technologies developed for nuclear and particle physics as well as medical imaging, polymer pellets developed for Inertial Confinement, and cryogenic injection guns developed for fueling tokamaks - have matured to the point where a direct in situ measurement is possible using the mirror reaction, D+^{3}He $\rightarrow \alpha$ +p. Designs and simulations of a proof-of-principle experiment at the DIII-D tokamak in San Diego will be discussed.

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