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Polarized ^3He Neutron Spin Filters for Neutron Scattering at Oak Ridge National Laboratory

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Polarized neutron scattering is a very useful method of determining spin densities and magnetic structures. It can also be used to separate nuclear coherent scattering from spin-incoherent scattering. When compared to other neutron polarizing techniques like Heusler crystals and polarizing supermirrors, polarized ^3He neutron spin filters provide several unique advantages: First, polarized ^3He can effectively polarize neutrons over a broad range of energies. Second, it has a large acceptance angle for incoming neutron beams. Third, it does not change direction of, or add divergence to, neutron beams. At Oak Ridge National Laboratory (ORNL), a polarized ^3He program has been established to meet the increasing needs from various neutron beamlines. ^3He is polarized through spin-exchange optical pumping at ORNL. Both ex situ and in situ systems have been developed to accommodate the requirements of different instruments. We report the current status of our development and present test results on several neutron beamlines at ORNL. Future application in small angle neutron scattering will also be discussed.

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