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On the use of perfect Si crystals in the development of innovative neutron optics

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We present recent developments in the field of innovative neutron optics using perfect Silicon single crystals. A multiplexed array prototype analyzer has been constructed for the cold neutron triple axis spectrometer ThALES. The prototype consists in an array of 17 Si stacks of 2 mm of thickness. Each stack is composed of 2 plastically bent Si(111) blades with a bending radius of 2 m. The prototype was tested on the instrument showing the high performance of this device and the continuous energy analysis with good resolution that can be achieved.
The technique of plastic deformation at high temperature was also used to produce high quality Si mosaic crystals with a mosaic distribution close to 0.2°. Such crystals exhibit excellent neutron properties and would represent an alternative to replace Ge mosaic crystal monochromators.
Finally, we have developed appropriate techniques to prepare Silicon 3He neutron spin filter cells entirely built from perfect Si crystals. Experimental relaxation times T1 were found to be close to expected values. We aim to build large banana Si 3He NSF cells to be installed in the PASTIS3 device for wide angle XYZ polarization analysis.

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