The IPEN-CNEN/SP PSD Neutron Diffractometer

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A new IPEN-CNEN/SP neutron powder diffractometer was constructed and installed at the 4.2 MW thermal IEA-R1m research reactor. It is an extensive upgrading of the old IPEN-CNEN/SP multipurpose neutron diffractometer. The old diffractometer was a single-detector instrument with a boron trifluoride (BF_3) detector and a flat copper mosaic single crystal monochromator. The main modification introduced in the old instrument was the installation of a position sensitive detector (PSD). The PSD is formed by eleven ^{3}He linear detector elements clamped together at each end to form a rigid plane. Placed at a distance of 1,6 m from sample, the PSD spans an angular range of 20º of a diffraction pattern, with a quite good resolution. In order to increase the neutron beam flux at the sample position, a focusing Si perfect single crystal monochromator was installed in the instrument. With a take-off angle of 84°, the monochromator can be positioned to produce 4 different wavelengths, namely 1.111, 1.399, 1.667 and 2.191 Å. In comparison to the former instrument, the new diffractometer has a better resolution and is *ca.* 600 times faster in data acquisition. The IPEN-CNEN/SP PSD neutron diffractometer has been designed mainly for crystalline and magnetic structures determination and for application of the Rietveld method in quantitative phase analysis. The utilization of this instrument is open for the brazilian and latin-american scientific and technological communities.

Keywords: neutron diffractometer, PSD detector, focusing monochromator