PMPO16. The New IPEN-CNEN/SP Neutron Powder Diffractometer

Parente, C.B.R.[1], *Mazzocchi, V.L.*[1], *Mascarenhas, Y.P.*[2]
cparente@curiango.ipen.br; vlmazzo@curiango.ipen.br; yvonne@if.sc.usp.br
[1] *Instituto de Pesquisas Energéticas e Nucleares – IPEN-CNEN/SP*
[2] *Instituto de Física de São Carlos – USP - campus de São Carlos*

A new IPEN-CNEN/SP neutron powder diffractometer, already presented to the community in a previous SBCr meeting, is under construction at the 2 MW thermal IEA-R1m research reactor. It is an 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 modifications introduced in the old instrument are: installation of a position sensitive detector (PSD) and a bent perfect single crystal monochromator. The PSD is formed by eleven linear detector elements, clamped together at each end to form a rigid plane. A linear detector element is a proportional counter manufactured by Reuter-Stokes Inc. The 25 mm outside diameter stainless steel cylindrical tube of a element have a wall thickness of 0.5 mm and an active detector length of 610 mm. The anode wire is nickel chrome with a diameter of 0.015 mm. The specific resistance of the wire is *ca.* 3500 Ω. The gas fill of the counters is 8 atm of ^3He, for neutron detection, and 4 atm of Ar, for stopping the reaction products (with 0.5% CO_2 for quenching). The PSD is installed in a detector shielding which is supported by two arms fixed in a large rotary table. This table provides the instrument with the 2θ angular movement. A smaller rotary table, placed underneath and concentric with the larger one, provides the $\omega(\theta)$ movement. Both tables are driven by a computer controlled geared mechanism. The computer also makes the data acquisition. The assemblage formed by rotary tables and mechanism is the same that had been used in the old diffractometer. A rotating oscillating collimator, placed at the entrance to the detector shielding, eliminates parasitic scattering from furnace or cryorefrigerator heat shields in the vicinity of the sample, while only reducing the scattered intensity by *ca.* 10%. The collimator also makes the PSD less sensitive to ambient background leaking in through the shielding entrance. Placed at a distance of 1600 mm from sample, the PSD spans an angular range of 20° of a diffraction pattern, resulting in a quite good resolution for the instrument. In order to increase the neutron beam flux at the sample position, a focusing Si monochromator will be 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. A beam shutter will protect operator during sample manipulation or installation of any device in the monochromatic beam. Other parts constructed for the new instrument are: a in-pile collimator, a monochromatic beam collimator and a neutron shield, large enough to accommodate the monochromator, the beam shutter and the monochromatic beam collimator. In comparison to the former instrument, the new diffractometer will have better resolution and will be *ca.* 600 times faster in data acquisition.

The authors acknowledge the financial supports given by Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), under project no. 95/05173-0, and Ministério da Ciência e Tecnologia, under project RXENZCS.