

Playing With Neutrons: Experimental Facilities at the IEA-R1 Reactor

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Due to their unique characteristics, neutrons are an excellent tool to probe materials, as well as to produce radionuclides for other uses. The IEA-R1, the largest nuclear research reactor in Brasil, located in IPEN-CNEN/SP, is a 5MW pool-type reactor from the mid-1950's that, despite its age, still provides important facilities for neutron irradiation and probing under high neutron fluxes. These facilities can be divided in two groups: in-core irradiation positions with fluxes ranging from 10^{12} to $10^{14} \text{cm}^{-2} \cdot \text{s}^{-1}$, where a sample is irradiated inside the reactor core for posterior analysis; and in-beam facilities, with 8 radial and 2 tangential tubes delivering collimated neutrons in the experimental hall with fluxes up to $10^8 \text{cm}^{-2} \cdot \text{s}^{-1}$, where a sample is irradiated outside the core, under a considerably lower flux, but with the possibility of real-time analysis and of better radiation filtering and collimation.

Different experiments can be performed using the IEA-R1 neutron sources, and this work intends to showcase these facilities, giving an insight regarding the specific properties of each, with their capabilities and some present applications, while also discussing some possible future applications.