The use of miniaturized samples to determine mechanical properties of materials

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The caracterization of irradiated materials through the SPT (Small Punch Test) technique uses miniaturized samples, with 8 mm in diameter and 0.5 mm in thickness, which has fixed edges, pressed by a sphere that has a diameter d=2.5 mm[1], tested in convencional mechanical testing machines, with the aid of a device developed for their achivement. This tecnique developed for nuclear industry can be used where conventional methods do not apply because it is considered an almost "non-destructive" method[2]due to the small sample volume. In this work two different devices were developed to perform tests at room and sub-zero temperature. The SPT tests will be carried out on standardized nuclear materials unirradiated (ferritic and stainless steels) for later correlation with conventional mechanical tests. Several mechanical properties will be obtained such as yield stress, tensile strength and fracture properties of the materials such as its toughness.

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References: [1]] ASTM E3205-20 Standard Test Method for Small Punch Testing of Metallic Materials, Annual Book of ASTM Standards, Part 03.01, ASTM International, 2020.

[2] M. F. Moreno, Effects of thickness specimen on the evaluation of relationship between tensile properties and small punch testing parameters in metallic materials, Materials and Design, 157 (2018) 512-522.