Effect of geometry and notch depth on the triaxiality of SPT specimens

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The small punch test or SPT is being used to obtain the mechanical properties of metallic materials by means of very small specimens [1] [2]. It allows the characterization when there is little availability of the material [3], or when conventional testing methods cannot be used [4], such as heat affected zones in welding processes or surface coatings. In this article the effect of the geometry and notch depth on the triaxiality is studied on several notched SPT specimens. Numerical simulations of SPT specimens of 0.5 mm and 1 mm of thickness have been carried with different notch depth (changing the depth of the notch relative to the specimen thickness) and three different geometries (central circular notch, longitudinal notch and longitudinal and transverse notch). The simulations have been carried out by means of the finite element software ABAQUS, considering large deformations and surface contacts. The simulated specimens were 3D modeled with a mesh with C3D8R elements and the Gurson-Tveergard-Needleman (GTN) model was used as the micro-mechanical damage model. Due to the small velocity of the test (0.2 mm/min) the analysis is considered quasi-static. For each analyzed configuration the triaxiality is obtained in the central section of the specimen from the beginning of the test till the onset of fracture.

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