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Experimental Characterization of the AA7075 Aluminum Alloy Using Hot Shear Tensile Test

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Abstract : The understanding of the material behavior under shear loading has great importance for a researcher in manufacturing processes like cutting, machining, milling, turning, friction stir welding, etc. where the material experiences large deformation at high temperature. For such material behavior analysis, hot shear tests provide a useful means to investigate the evolution of the microstructure at a wide range of temperature and to improve the material behavior model. Shear tests can be performed by direct shear loading (e.g. torsion of thin-walled tubular samples), or appropriate specimen design to convert a tensile or compressive load into shear (e.g. simple shear tests). The simple shear tests are straightforward and designed to obtained very large deformation. However, many of these shear tests are concerned only with the elastic response of the material. It is becoming increasingly important to capture a plastic response of the material. Plastic deformation is significantly more complex and is known to depend more heavily on the strain rate, temperature, deformation, etc. Besides, there is not enough work is done on high-temperature shear loading, because of geometrical instability occurred during the plastic deformation. The aim of this study is to design a new shear tensile specimen geometry to convert the tensile load into dominant shear loading under plastic deformation. Design of the specimen geometry is based on FEM. The material used in this paper is AA7075 alloy, tested quasi statically under elevated temperature. Finally, the microstructural changes taking place during

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