

New approach for determination of strain rate sensitivity of mild steel DC01 under stack compression and uniaxial tensile tests

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ABSTRACT

Deformation under uniaxial tensile loading with using Digital Image Correlations (DIC) is the easiest way to analyze the material behavior in sheet metal forming. In order to determine the plastic parameters such as hardening, anisotropy and strain rate sensitivity at higher strain level, equi-biaxial stress state is prerequisite. As reported in the literature, Bulge tests are frequently used for this purpose, but in this work, stack compression test is used as an alternative. In this experiment, deformation in the middle layer where the friction effect is minimum, was monitored using two pairs of DIC systems in rolling and transversal directions. Uniaxial tensile tests as well as stack compression tests were performed on mild steel DC01 at different strain rates, from 0.001 s^{-1} to 10 s^{-1} . Similar hardening behaviors were observed for both experiments at the same strain rate. Besides, strain rate sensitivity parameter was investigated at different level of strains for both experiments. Results show a decrease of material strain rate sensitivity with increasing the equivalent plastic strain.