Experimental study on mechanical properties of aluminum alloys under uniaxial tensile tests

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Abstrak

The 7075 aluminum alloy (a typical Al–Zn–Mg–Cu alloy) is one of the most important engineering alloys. It is mainly used in the automotive industry, in transport and aeronautics, due to its excellent strength/weight ratio. The purpose of the present research is to model the behavior of 7075 aluminum alloy and to build an experimental database to identify the model parameters. Firstly, the paper presents an experimental device of simple tensile tests and the studied material on 7075 aluminum alloy. Thus, uniaxial tensile tests are carried out in three loading directions relative to the rolling direction. From experimental hardening curves and Lankford coefficients, the mechanical properties are extracted, particularly the various fractures owing to pronounced anisotropy relating to the material. Secondly, plastic anisotropy is then modeled using the identification strategy which depends on yield criteria, hardening and evolution laws. By smoothing experimental hardening curves in the tensile tests, a selection is made in order to choose the most appropriate hardening law for the identification of the studied material. Finally, a comparison with experimental data shows that the behavior model can successfully describe the anisotropy of the Lankford coefficient.