

Deformation of Aluminium-steel Clad Material Prepared by Twin-roll Casting

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Aluminium-steel clad materials combine advantages of both monomaterials – ductility and corrosion resistance of aluminium and strength of steel. Final properties of the material are governed by the intermetallic phase layer, which forms at the aluminium-steel interface upon annealing. The limiting thickness of the layer is 10 μm [1], larger layer deteriorates mechanical properties. The layer is composed by two main phases – orthorhombic Al_5Fe_2 and monoclinic $\text{Al}_{13}\text{Fe}_4$ [2]. The Al-steel material heat-treated at different temperatures was submitted to tensile tests, which were analyses with help of digital image correlation (Fig. 1). The influence of the interface was most prominent at the beginning of the deformation due to different Young's modulus and Poisson's ratio – the deformation localizes at the interface. The necking is more apparent in the aluminium side of the specimen, which deforms plastically, whereas the deformation in the steel layer is rather brittle.

Keywords: Aluminium-steel clad, tensile test, digital image correlation

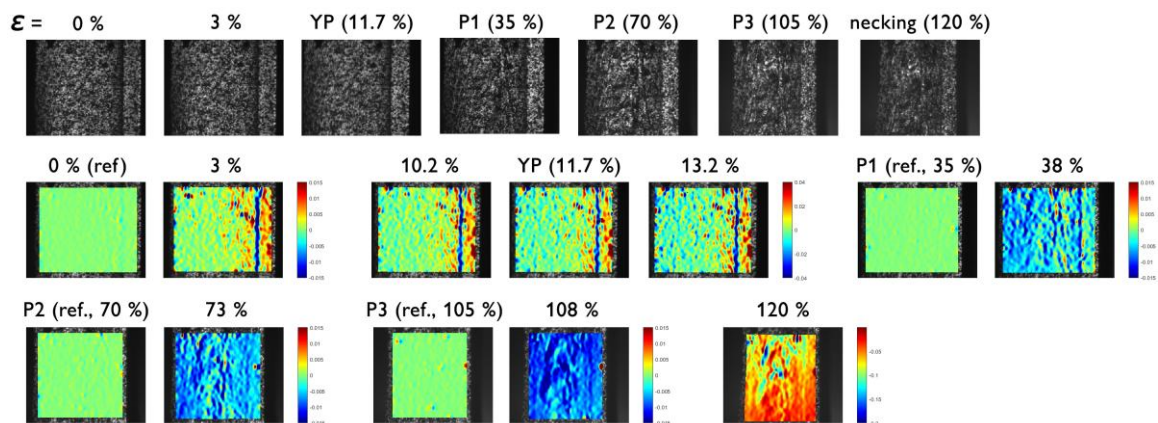


Fig.1 Digital image correlation analysis of a tensile test of the aluminium-steel clad sheet without heat treatment

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References:

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[2] B. Křivská et. al., Materials, 14, 2021, 7771.