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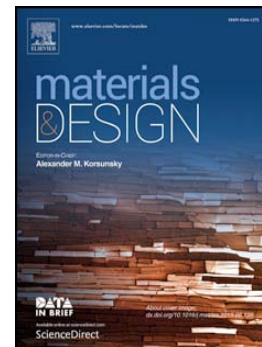
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Influence of Crystallographic Texture on Microstructure, Tensile Properties and Residual Stress State of Laser-Welded Titanium Joints

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Abstract

Preferred grain orientations (crystallographic texture) of base materials could influence on mechanical properties, microstructure and residual stresses of welded joints. This should be considered for design purposes, in particular for materials having non-cubic crystal structures. A multitude of experiments have been carried out in this field of study without considering the crystallographic texture based anisotropy of base materials. In the present work, commercially pure titanium (CP-Ti) rolled sheets were laser welded along various directions with respect to the sample orientations, namely rolling direction (RD), transverse direction (TD) and 45° to RD. Three-dimensional strain profiles and the local texture around the weld were measured by neutron diffraction. Furthermore, grain orientation mapping within the base material, the heat-affected zone and the fusion zone was investigated using the electron back-scatter diffraction (EBSD) technique. The results revealed that tensile properties of the samples are different, while no significant statistical differences in residual stresses were observed.

Keywords: Laser welding; crystallographic texture; microstructure; residual stress; titanium

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