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CHANGE OF CRYSTALLOGRAPHIC ORIENTATION DISTRIBUTION DURING FORMING IN CARBON STEEL DEFORMED BY DEEP DRAWING

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Abstract : Advances in techniques for measuring individual crystallographic orientations have made possible to investigate the role of local crystallography during crack propagation in polycrystalline materials. The change in crystallographic orientation distribution during deformation by deep drawing in carbon steel has been investigated in order to understand the deformation mechanisms leading to crack propagation. The well-known strain rate dependence of the deformation behaviour was examined by SEM-EBSD (scanning electron microscopy/electron back scatter diffraction pattern) analysis. This tool was used particularly to characterize the various crystallographic parameters. Evolution of grain boundary distribution during plastic deformation strongly depends of strain rate. Fraction of low angle grain boundaries increased after deformation with high strain rate, presumably due to dislocation activity, while fraction of random boundaries was high in the specimen deformed with low strain rate, and one observes conservation of initial texture. Further, the intragranular misorientation, transgranular misorientation and local orientation are analyzed in relation with the accommodation process during plastic deformation.

Keywords : crack propagation, strain rate, grains boundaries, texture, EBSD.