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MICROSTRUCTURAL ENGINEERING IN DUAL PHASE STEELS –PARTITIONING ASPECTS AND CORRELATION TO FORMABILITY

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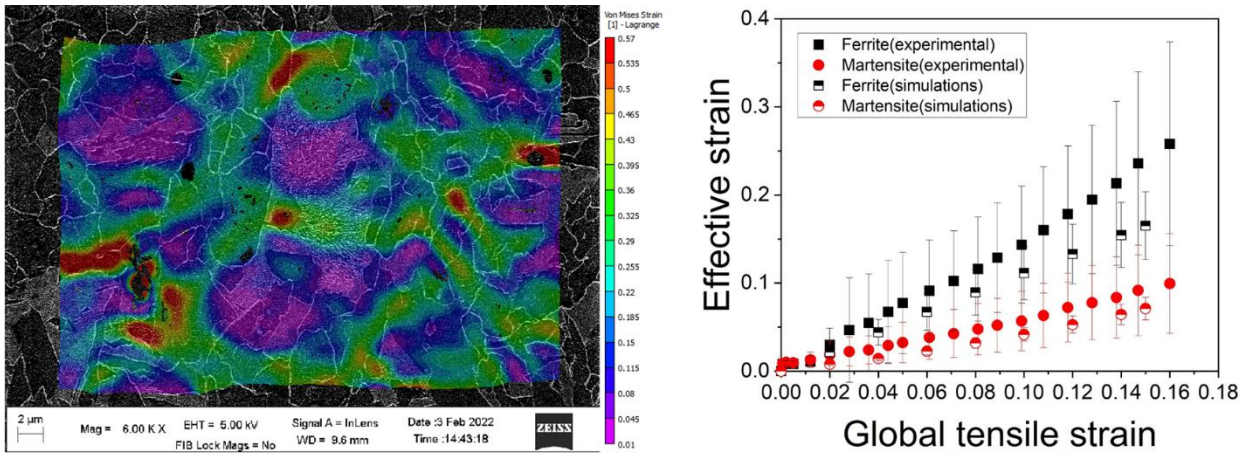
Abstract

Dual phase (DP) steels, a functional example of advanced high strength steels, are heavily employed in the automobile industry where high formability becomes a prerequisite. Improving formability directly correlates to delaying failure under complex stress fields, in other words post-necking ductility. This requires an understanding of the partitioning behavior of stresses, strains and triaxialities at a microstructural level[1], [2]. A combination of experiments and simulations have been used to predict the effect of microstructural variables like phase hardness differential, martensite volume fraction and size on the partitioning characteristics of DP, and their concurrent effect on the strength-ductility optimization. The knowledge obtained from such studies is used to generate and validate microstructures with desirable formability. This microstructural engineering approach can thus be used to obtain DP microstructures which provide enhanced partitioning and hence better resistance to failure during their manufacturing and service.

Keywords: Dual Phase steel; microstructure; simulation; strain partitioning, microstructure engineering.



(a) (b)

Fig 1. Strain-partitioning in DP: (a) Effective strain contour overlaid on a DP microstructure at a global strain of 16%, (b) overall strain-partitioning between the soft ferrite and hard martensite phases.

References

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