

STRAIN AGEING PHENOMENA IN NICKEL-BASED SUPERALLOYS AND ZINC-COATED STEEL SHEETS: EXPERIMENTS AND MODELLING

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ABSTRACT

Static and dynamic strain ageing phenomena induced by the interaction between dislocations and solute atoms, are ubiquitous in engineering metallic alloys. In Nickel-based superalloys used for turbine disks in jet engines, negative strain rate sensitivity is observed at service temperature and results in the development of Portevin-Le Chatelier bands. A viscoplastic constitutive model will be presented which captures the serrations in tensile notch samples and biaxial tension specimens. Finite element simulations then show the impact of DSA on the burst of turbine disks [1]. Static strain ageing is associated to the formation of Lüders bands in steel sheets. We illustrate the impact of their propagation on the viscoplastic behaviour of zinc coatings on galvanized steel sheets, by means of crystal plasticity applied to zinc grains [2].

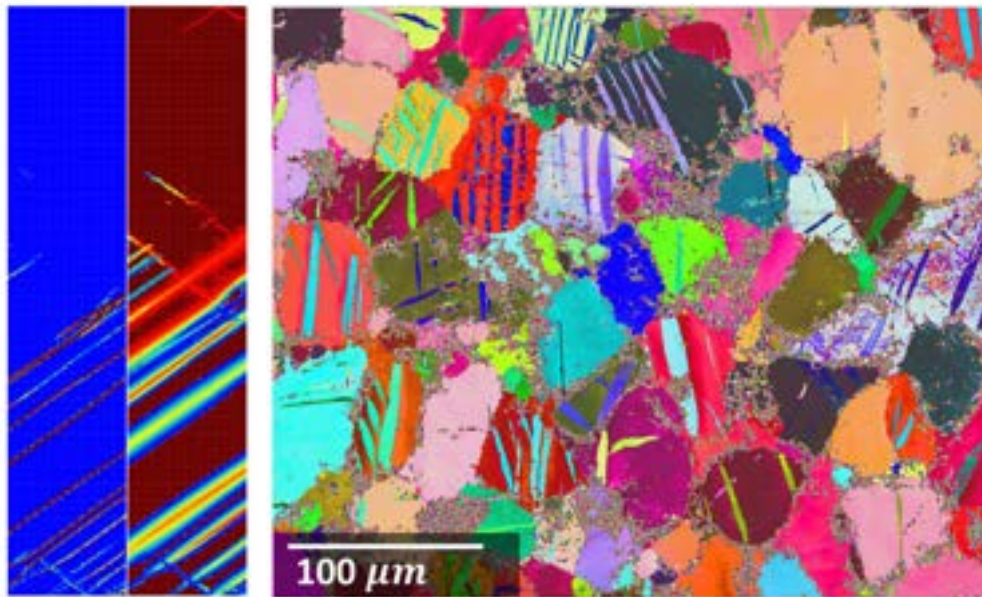


Figure 1: Simulation of PLC bands in a plate in tension: plastic strain rate bands and field of ageing time variable (left); twinning in deformed zinc grains on a steel substrate (right).

REFERENCES

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