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C.Eng. 1997
MIM 1997
BSc (Eng) 1987
ARSM 1987
DIC 1991
PhD., The University of London (1991)

RESEARCH INTERESTS

Dr. Davies' research interests lie in the field of thermomechanical processing of metals. Always mindful of the product-process linkage, Dr. Davies tries to combine industrial relevance with the application of fundamental knowledge. The approach has led to the use of empirical and phenomenological models, and simulations in the following areas:

1. Computer simulation of recrystallisation. The cellular automaton approach has been applied to the simulation of microstructural evolution during recrystallisation. This technique differs from current techniques in that the evolution of microstructure is *simulated*, and from this the kinetics are *derived*. This is in contrast to commonly used methods which measure the kinetics and fit the data to a known equation. Simulations are calibrated using the microstructural path method, and their results are compared to experimental kinetics and grain size distributions. Recently acquired electron backscattering diffraction equipment is being used to incorporate crystallographic texture into the simulation.

2. Constitutive behaviour of metals. Microstructure modelling based on a population dynamics approach has resulted in a single non-linear equation which, depending on the parameters chosen, is able to model work-hardening, recovery, or recrystallisation The model is calibrated using experimental data from axi-symmetric hot compression testing.

3. Thermomechanical processing of steels. Several areas are being investigated: advanced flow stress models for hot working; the effect of nitrogen on the transformation behaviour of steels; low and ultra-low carbon bainitic steels. In each of these studies the aim has been to elucidate the behaviour of the steels with a view to improving their processing, and our understanding of their properties and limitations.

SELECTED PUBLICATIONS

C.H.J. Davies, 'Application of the renormalization group method to the failure of fibre bundles', Journal of Materials Science Letters, *14, 24, 1813-1814, 1995.*

C.H.J. Davies, 'The effect of neighbourhood on the kinetics of a cellular automaton recrystallisation model', Scripta Metallurgica et Materialia, *33, 6, 1139-1143, 1995.*

C.H.J. Davies, W.-C. Chen, D.J. Lloyd, E.B. Hawbolt, I.V. Samarasekera, and J.K. Brimacombe, 'Modelling particle fracture during the extrusion of an aluminium/alumina composite', Metallurgical and Materials Transactions, *27A, 4113-4120, 1996.*

W.C.Chen, C.H.J. Davies, I.V. Samarasekera, E.B. Hawbolt and J.K. Brimacombe, 'Mathematical modelling of the extrusion of 6061/Al_2O_3/20p composites', Metallurgical and Materials Transactions, *27A, 4095-4111, 1996.*

C.H.J. Davies, 'Growth of nuclei in a cellular automaton simulation of recrystallisation', Scripta Materialia, *36, 35-40, 1997.*