

Contents

Foreword v

Preface vii

Part I. YIELD AND FLOW

1. The Yield and Flow Stress Dependence on Polycrystal Grain Size 1

R. W. ARMSTRONG, *Office of US Naval Research, 223 Old Marylebone Road, London NW1 5TH, UK, formerly College of Engineering, University of Maryland, College Park, Maryland 20742, USA*

2. The Plastic Deformation of Polycrystalline Aluminium . . . 33

J. T. AL-HAIDARY, *Department of Metals and Production, University of Technology, Baghdad, Iraq,* and N. J. PETCH, *Department of Metallurgy, University of Strathclyde, Colville Building, 48 North Portland Street, Glasgow G1 1XN, UK,* and E. DE LOS RIOS, *Department of Mechanical Engineering, University of Sheffield, Mappin Street, Sheffield S1 3JD, UK*

3. Some Aspects of the Plastic Deformation of Phase Mix-
tures with Coarse Microstructures 51
J. GURLAND, *Division of Engineering, Brown University,
Providence, Rhode Island 02912, USA*
4. Plasticity of Porous Metals 69
J. W. HANCOCK, *Department of Mechanical Engineering,
University of Glasgow, Glasgow G12 8QQ, UK*

Part II. FRACTURE OF POLYCRYSTALLINE MATERIALS

5. Cleavage Fracture and the Toughness of Structural Steel 81
J. F. KNOTT, *Department of Metallurgy and Materials Sci-
ence, University of Cambridge, Pembroke Street, Cambridge
CB2 3QZ, UK*
6. Crack Branching in the Fracture of Alumina 101
J. CONGLETON, *Department of Metallurgy and Engineering
Materials, University of Newcastle, Haymarket Lane, New-
castle upon Tyne NE1 7RU, UK*
7. Brittle Fracture from Pile-ups in Polycrystalline Iron 123
A. COTTRELL, *Jesus College, Cambridge, CB5 8BL, UK*
8. The Effects of Plastic Flow Localisation and Shear Band
Decohesion on the Stability of Fracture from a Pre-existing
Crack 131
E. SMITH, *Joint Manchester University/UMIST Metallurgy
Department, Grosvenor Street, Manchester M1 7HS, UK*

Part III. APPLICATION OF HALL-PETCH AND COTTRELL-PETCH RELATIONSHIPS

9. The Effect of Grain Size on the Mechanical Properties of
Ferrous Materials 141
T. GLADMAN, *Physical Metallurgy Department, BSC
Sheffield Laboratories, Swinden House, Moorgate,*

Rotherham S60 3AR, UK, and F. B. PICKERING, Department of Metallurgy, Sheffield City Polytechnic, Pond Street, Sheffield S1 1WB, UK

10. The Effect of Pearlite on the Yield Stress of Simple Structural Steels	199
R. R. PRESTON, <i>Rails and Sections Department, BSC Sheffield Laboratories, Swinden House, Moorgate, Rotherham S60 3AR, UK</i>	
11. An Updating Assessment of the Role of the Microalloys in HSLA Steels	211
A. M. SAGE, <i>Highveld Steel and Vanadium Corporation, 1st Floor, Winterton House, High Street, Westerham, Kent TN16 1AJ, UK</i>	
12. Estimating the Parameters of the Petch Equation	225
J. H. WOODHEAD, <i>Department of Metallurgy, University of Sheffield, Mappin Street, Sheffield S1 3JD, UK</i>	
13. Determination of the Friction Stress from Microstructural Measurements	235
T. N. BAKER, <i>Department of Metallurgy, University of Strathclyde, Colville Building, 48 North Portland Street, Glasgow G1 1XN, UK</i>	
14. The Development of Substructure in Aluminium and Aluminium Alloys	275
H. CHANDRA-HOLM, <i>Institut für Metallforschung, ETH Zentrum, CH 8092, Zürich, Switzerland, and J. D. EMBURY, Department of Metallurgy and Materials Science, McMaster University, Hamilton, Canada</i>	
15. Flow Stress and Grain Size Dependence of Non-Ferrous Metals and Alloys	311
N. HANSEN, <i>Metallurgy Department, Risø National Laboratory, Postbox 49, DK-4000 Roskilde, Denmark</i>	
Appendix: Professor Norman J. Petch—List of Publications	351
Index	355