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HoMMage

TECHNISCHE UNIVERSITÄT DARMSTADT

UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Hysteresis Design of Magnetic Materials for Efficient Energy Conversion

Tuesday, 12 October 2021, 9:00 s.t., UDE, Campus Duisburg MG272 (in Person) and

Zoom - Meeting ID: 225 349 6215 https://uni-due.zoom.us/j/2253496215

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Chair for Materials Science

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On the transition between lath and plate martensite in the Fe-Nisystem

Abstract:

In the binary FeNi system martensite start temperatures decrease from 500 to 200K when Ni concentrations increase from 20 to 30 at.%. Below 28.5 at.% Ni the martensitic microstructures consist of lath martensite (athermal transformation, small crystals, accommodation by dislocations) and above this, plate martensite (burst-like transformation, large crystals, accommodation by twins). For Ni concentrations close to 28.5 at.%, we observe a local Ms maximum which has not previously been reported. This maximum is associated with a transition martensite microstructure, which evolves assisted by two accommodation processes, twinning and dislocation plasticity. We use a Clausius Calpeyron type relation in combination with a micromechanical analogon to rationalize our findings. We also discuss contributions due to magnetic effects and due to atomic percolation. An analytical quantitative EBSD method is used to determine the distributions of the three angles, which describe small angular deviations between crystal planes in the unit cells of martensite and austenite, which are related through specific orientation relationships. The analysis of the angular distributions not only provides information on the type of martensite (lath, plate or transition) but also reveals why it is difficult to distinguish between the different austenite-martensite orientation relationships.

About the speaker:

Positions Held / Affiliations

- *April 1995 – present:* Professor for Materials Science at the Ruhr-University Bochum, Germany
- *October 2012 – December 2012:* Visiting Scholar at the University of California, Santa Barbara, USA
- *January 2013 – March 2013:* Visiting Scholar at CEA Saclay, France
- *January 2009 – December 2012:* Adjunct Professor at the Materials Department of the Jiatong University in Xian, China
- *January 2008 – Februar 2008:* Brahm Prakash Visiting Professor at the Indian Institute of Science, Bangalore
- *January 2004 – March 2004:* Visiting Scholar at the Centro Atomico der Bariloche, Argentina
- *October 1999 - March 2000, October 2003 – December 2003, October –December 2008:* Visiting Scholar at The Ohio State University, Columbus, Ohio, USA
- *since January 2004:* Adjunct Faculty at the Materials Science Department of The Ohio State University

- *May 1990 - March 1995:* Research Associate at the Swiss Federal Institute of Technology in Lausanne, Switzerland
- *November 1992 - March 1995:* Lecturer for Materials at the Ecole d'Ingenieurs du Valais in Sion, Switzerland
- *January 1987 - March 1990:* Senior Principal Metallurgist at ERA Technology Ltd, England
- *March 1985 - December 1987:* Postdoc at the Swiss Federal Institute of Technology in Lausanne, Switzerland
- *November 1982 - February 1985:* Research Associate at the Friedrich-Alexander University in Erlangen, Germany
- *November 1979 - October 1982:* Graduate Student at the Friedrich-Alexander University in Erlangen, Germany

Education and Degrees

- *August 1992 - Habilitation* at the Swiss Federal Institute of Technology in Lausanne, Group of Prof. Dr. B. Ilschner; Thesis: Assessment of Low Cycle Fatigue Activities in the European Research Program COST 50
- *February 1985 - Dr.-Ing. Degree* at the Friedrich-Alexander University in Erlangen, Germany, at the Chair for Corrosion and Surface Technology (Prof. Dr. H. Kaesche) - Group of Dr. W. Auer; Dr.-Ing.-Thesis (in German): Thermodynamics and Kinetics of the Reaction between Steel and Aluminium Melts
- *September 1980 - Dipl.-Ing. Degree* at the Friedrich-Alexander University in Erlangen, Germany, at the Chair for General Material Properties (Prof. Dr. B. Ilschner) - Group of Prof. Dr. W. Blum; Dipl.-Ing.-Thesis (in German): Response of the Dislocation Substructure to Stress Reduction during Creep of NaCl Single Crystals

Research Interests

- Elementary deformation processes; High temperature materials
- Martensitic transformations; Shape memory alloys
- Analytical transmission and scanning electron microscopy
- High temperature solid state reactions, solidification processes and interaction of solids with gases and melts
- Modelling of elementary processes governing microstructural evolution