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Přednáška

On the use of advanced transmission electron microscopy for characterizing elementary transformation and deformation processes in shape memory alloys and high temperature materials

Gunther Eggeler

Institut für Werkstoffe, Fakultät für Maschinenbau
Ruhr-Universität Bochum
Německo

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Metallic engineering alloys like NiTi shape memory alloys or high temperature alloys (here: tempered martensite ferritic steels and Ni-base super alloys) often have complex microstructures. Key elements of their microstructures (like dislocations and small particles) are so small that they can only be resolved using transmission electron microscopy (TEM). A short description of the advantages of diffraction contrast scanning transmission electron microscopy (STEM) in a modern analytical TEM equipped with a high angle annular dark field (HAADF) detector is given [1]. It is then shown that this technique has sufficient resolution and enables to study large regions in TEM foils, which is important wherever collective phenomena govern material behavior. It is also demonstrated that the technique can be combined with stereo microscopy such that anaglyphs are obtained which gives a realistic 3D impression of the spatial arrangement of the microstructure . **Some recent results on microstructural evolution in NiTi shape memory alloys [2], 12% Cr tempered martensite ferritic steels [3] and Ni-base single crystal super alloys will be presented [4]. The three material classes will be briefly introduced and, for each material, an example showing how HAADF STEM can help to uncover elementary transformation or deformation processes in solids will be given.**

[1] L.Agudo Jácome, G.Eggeler, A.Dlouhý, Advanced scanning transmission electron microscopy of structural and functional engineering materials, Ultramicroscopy, 122 (2012) pp.48-59

[2] T.Simon, A.Kröger, C.Somsen, A.Dlouhý, G.Eggeler, On the multiplication of dislocations during martensitic transformations in NiTi shape memory alloys, Acta Mat., 58 (2010) pp. 1850-1860

[3] J.Pešička, R.Kužel, A.Dronhofer, G.Eggeler, The evolution of dislocation density during heat treatment and creep of tempered martensite ferritic steels, Acta Mat., 51 (2003) pp. 4847-4862

[4] L.Agudo Jácome, P.Nörtershäuser, J.-K.Heyer, A.Lahni, J.Frenzel, A.Dlouhý, C.Somsen, G.Eggeler, High-temperature low-stress creep anisotropy of single-crystal superalloys, Acta Mater., 61 (2013) pp. 2926-2943

Prof. Ing. Pavel Lejček, DrSc.
vedoucí sekce 2