

Lecture: Chemical and kinetic characterization of diffusive phase transformations.

Year 3

Prof. Paweł Zięba

Topics covered:

1. Fundamentals of diffusion processes in metals and alloys
2. Principles of high resolution chemical analysis on analytical electron microscopy (*activated volume of X-ray signal; spatial resolution; relation between specimen geometry, incident electron beam and location of EDX detector in microanalysis of lamellar structures; detectability limit, signal convolution*)
3. Fundamentals of interface migration during solid-state discontinuous reactions (*principles of nucleation and growth of discontinuous precipitation, coarsening, dissolution, ordering, diffusion induced grain boundary migration*)
4. Characterization of the kinetics of diffusion process at migrating interface of discontinuous precipitates (*global characterization, local characterization via AEM, determination of grain boundary diffusivity*)
5. Determination of interdiffusion coefficient (*diffusion couple, precipitation of grain boundary allotriomorphs, diffusion soldering*)
6. Determination of growth mechanism during phase transformation (*solute partitioning in intragranular ferrite, bainitic transformation in CuZnAl alloys*)

The course is based on:

Zięba P.: Recent Progress in the Energy Dispersive X-ray Spectroscopy Microanalysis of the Discontinuous Precipitation and Discontinuous Dissolution Reactions, Materials Chemistry and Physics 62, (2000) 183-213

P. Zieba, Local Characterization of the Chemistry and Kinetics in Discontinuous Solid State Reactions, Cracow 2001