

Small-Angle scattering techniques: tools for the understanding of the kinetics of complex precipitation phenomena in metallic alloys

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We will review how small-angle scattering techniques are able to provide quantitative information on precipitation phenomena in various metallic systems, mostly Al-based and Fe-based. Both X-ray and neutron scattering will be reviewed, with particular emphasis on the following aspects:

- Time-resolved studies as a tool for quantifying precipitation kinetics and being a benchmark for precipitation models
- Contrast evaluation, namely Anomalous X-ray scattering and comparison between magnetic and nuclear scattering of neutrons, as a tool for evaluating the chemical composition of nanoscale precipitates
- Time-resolved study of precipitate microstructure evolution under thermo-mechanical treatments, as a tool for evaluating the coupling between precipitation and dislocation movement
- Mapping of heterogeneous microstructures such as weld cross sections

Examples will cover various metallic systems such as Al-Zn-Mg-Cu, Al-Li-Cu, Fe-Cu, Fe-Si-Ti