SPECTROSCOPIC STUDIES INTO THE REACTIVITY OF SOLIDS

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Spectroscopic studies can provide insight into a large variety of physical and chemical processes in solids. In this contribution, several selected examples will be presented of spectroscopic investigations of solid state reactions involving the discussion of point defects, atomic diffusion, and reaction mechanisms. The emphasis is on spectroscopic in-situ experiments performed at high temperatures and defined gas activities, allowing for the direct observation of reaction kinetics. Examples will be chosen from optical and Mössbauer spectroscopy.

Due to the local nature of the information available from these techniques, they provide powerful tools for the investigation of structurally and constitutionally complex solids. Thus the examples reported in this talk will refer to materials like garnets, perovskites, and olivines.

In detail, the following topics will be presented: i) an optical in-situ study into the redox kinetics of $Yb_3Al_5O_{12}$ garnet [1], ii) an optical high-temperature study into the cation re-equilibration kinetics in Co-Mg olivines, Fig. 1 [2], and iii) a Mössbauer study into the formation reaction of the iron nitride Fe_4N.

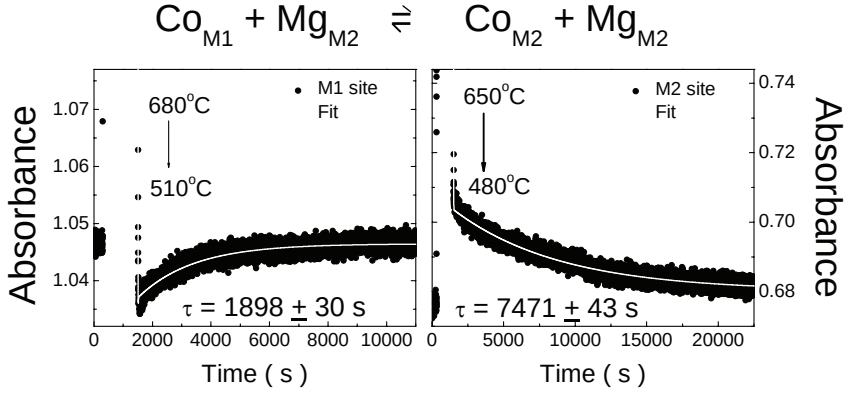

Fig. 1. Kinetics of cation distribution in $(Co_{0.6}Mg_{0.4})_2SiO_4$ observed for M1 and M2 sites after temperature jumps.

References

[1] M. Kreye, K.-D. Becker, Phys.Chem.Chem.Phys. **5** (2003) 2283
[2] M. Mutke, M. Kreye, J. Shi, K.-D. Becker, Phys. Chem. Chem. Phys. 10 (2008) 3895.