Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Codoping – A way to enhance the upper critical field in iron-arsenic superconductors[1] M. NICKLAS, MPI for Chemical Physics of Solids, Dresden, Germany, F. WEICKERT, LANL, MPA-CMMS, Los Alamos, NM, USA, J. WOSNITZA, HLD, HZDR, Dresden, Germany, A. LEITHE-JASPER, W. SCHNELLE, H. ROSNER, MPI for Chemical Physics of Solids, Dresden, Germany
— Technological key features of iron-based superconductors are the high critical temperature T_c of up to 55 K and the high tolerance against magnetic fields, which led so far to upper critical fields in the range of 75 T. Furthermore, the small H_{c2}-anisotropy between field applied along the c-direction and in the ab-plane, in particular for the FeSe and $AE\mathrm{Fe_2As_2}$ (AE = Ca, Sr, Ba) materials, is a prerequisite for several technical applications. Currently, different approaches (chemical substitutions, processing) are discussed how to increase H_{c2} further. Here, we show a feasibility study for codoping of polycrystalline Sr- or $\mathrm{BaFe_2As_2}$ samples, namely the simultaneous substitution of K on the Sr/Ba layer and of Co on the FeAs layer. The upper critical field was investigated by magnetoresistance in high pulsed magnetic fields up to 64 T. We find, that the extrapolated critical field $H_{c2}(T \rightarrow 0)$ is enhanced by 15% for $\mathrm{Ba_{0.55}K_{0.45}Fe_{1.95}Co_{0.05}As_2}$ in comparison to $\mathrm{Ba_{0.55}K_{0.45}Fe_2As_2}$, although T_c is almost identical in both materials. These results suggest that codoping is a promising route for the systematic optimization of iron-arsenic based superconductors for high-magnetic field and high-current applications.

[1]Supported by the MPG Research Initiative: Materials Science and Condensed Matter Research at the HLD, EuroMagNET II under the EC contract 228043, and DFG through SPP 1458

M. Nicklas
MPI for Chemical Physics of Solids, Dresden, Germany

Date submitted: 13 Nov 2011 Electronic form version 1.4