MAR10-2009-005188

Abstract for an Invited Paper
for the MAR10 Meeting of
the American Physical Society

Crystal chemical aspects of superconductivity in $BaFe_2As_2$ and related compounds

DIRK JOHRENDT, LMU Muenchen

$BaFe_2As_2$ is the parent compound of the 122-type iron arsenides.[1] Superconductivity can be induced by several kinds of doping[2–4] or by pressure.[5] It is widely accepted that superconductivity in iron arsenides is unconventional and a number of experiments agree with the s±-scenario.[6] The latter relies on Fermi surface nesting which depends on both the electron count and the lattice. However, the coincidence of doping and pressure effects on the structure of $BaFe_2As_2$ supports the role of the structure.[7] Another open issue is the co-existence of superconductivity and AF magnetic ordering. Our ^{57}Fe-Mössbauer experiments with underdoped $Ba_{0.8}K_{0.2}Fe_2As_2$ (T_c = 24 K) revealed full magnetic splitting, which indicates such a co-existence.[8] Compounds like Sr_2VO_3FeAs (T_c = 37-45 K) are promising candidates for higher T_c, but their crystal chemistry is not yet understood. In non-superconducting Sr_2CrO_3FeAs, we have detected a non-stoichiometry of the Fe-site ($Fe_{0.93(1)}Cr_{0.07(1)}$) and *C*-type AF ordering of the Cr^{3+}-layers.[9] The Cr-doping of the FeAs layer is probably detrimental to superconductivity in Sr_2CrO_3FeAs, but a similar non-stoichiometry may play a vital role in Sr_2VO_3FeAs.

-

[1] M. Rotter, M. Tegel, I. Schellenberg, et al., Phys. Rev. B **78**, 020503 (2008).
[2] M. Rotter, M. Tegel, and D. Johrendt, Phys. Rev. Lett. **101**, 107006 (2008).
[3] S. Jiang, C. Wang, Z. Ren, et al., J. Phys.: Condens. Matter **21**, 382203 (2009).
[4] A. S. Sefat, R. Jin, M. A. McGuire, et al., Phys. Rev. Lett. **101**, 117004 (2008).
[5] P. L. Alireza, Y. T. C. Ko, J. Gillett, et al., J. Phys.: Condens. Matter **21**, 012208 (2009).
[6] I. Mazin, D. J. Singh, M. D. Johannes, et al., Phys. Rev. Lett. **101**, 057003 (2008).
[7] M. Rotter, M. Pangerl, M. Tegel, et al., Angew. Chem. Int. Ed. **47**, 7949 (2008).
[8] M. Rotter, M. Tegel, I. Schellenberg, et al., New J. Phys. **11**, 025014 (2009).
[9] M. Tegel, Y. Su, F. Hummel, et al., arXiv0911.0450.