MS070.O01

Tc-enhancement of Fe1+δSe by electrochemical lithium intercalation

Evgeny Antipov[1], Anastasya Alekseeva[2], Oleg Drozhzhin[2], Olga Volkova[1], Alexander Vasiliev[3], Dmitry Chareev[4], Juri Grin[5]
[1]Department of Chemistry, Lomonosov Moscow State University, Moscow, Russian Federation, [2]MPG-MSU Partner Group, Department of Chemistry, Lomonosov Moscow State University, Moscow, Russian Federation, [3]Department of Physics, Lomonosov Moscow State University, Moscow, Russian Federation, [4]Institute of Experimental Mineralogy, Russian Academy of Sciences, Chernogolovka, Russian Federation, [5]Max-Planck-Institut für Chemische Physik fester Stoffe, Dresden, Germany
E-mail: evgeny.antipov@gmail.com

The superconducting transition temperature (Tc) of tetragonal Fe1+δSe can be enhanced from 8.5 K to 44 K by chemical structure modification resulting in significant increase of [Fe2Se2]-interlayer separation: from 5.5 Å in native Fe1+δSe to > 7 Å in KxFe1−ySe and to > 9 Å in Li1−xFex(OH)Fe1−ySe. Structure modification is achieved by the shift of the [Fe2Se2]-slabs and filling the interlayer space by solvated lithium and iron cations or by large alkaline cations like K. We report the application of electrochemical approach to modification of Fe1+δSe superconducting properties. In contrast to chemical way the electrochemical approach allows to insert small amount of non-solvated Li+ into Fe1+δSe structure keeping the native structure and [Fe2Se2]-layers arrangement. The amount of intercalated lithium is extremely small (about 0.07 Li+ per f.u), however, caused slight change of carrier concentration results in enhancement of Tc up to ~ 44 K. The obtained results provide the opportunity to better understand the mechanism of superconductivity in Fe-based superconductors and open new possibilities for Tc-enhancement.

Keywords: superconductivity, iron selenide, Li-ion intercalation