Intrinsic non-stoichiometry and anomalous transport properties of layered oxysulfide LaOPbBiS3

David Berardan*[1] and Céline Byl[2]

[1]Univ. Paris Saclay – Université Paris-Sud - Université Paris-Saclay – ICMMO Faculté des sciences d'Orsay, bat 410 91405 ORSAY, France

[2]Univ Paris Saclay – Université Paris-Sud - Université Paris-Saclay – ICMMO, Univ Paris Saclay (present address: ESPCI Paris), France

Résumé

Since the first report of superconductivity in LaO1-xFxBiS2 in 2012, BiCh2 layered oxysulfides have been thoroughtly studied as superconductors and as potential n-type thermoelectric materials, and have been shown to have a versatile crystal structure with various possible analogues. Although there has been many publications devoted to the compounds belonging to the LaOBiS2 structure, this is much less the case of those containing rocksalt layers intercalated within the Van der Waals gap of the structure. It is especially the case of LaOPbBiS2-based materials with a PbS rocksalt layer, which may be due to the difficulty in synthesizing good quality samples, although they also exhibit interesting n-type thermoelectric properties due to intrinsically low thermal conductivity and superconductivity under chemical or external pressure.

I will show in this presentation that these difficulties originate from a spontaneous partial substitution of Pb by Bi in the rocksalt layer of these compounds leading to instrinsic non-stoichiometry and self n-type doping. Besides, fluorine doping in the LaO reservoir layer of LaOPbBiS2 in order to optimize the concentration of carriers leads to the emergence of a marked anomaly in the temperature dependence of the electrical properties, with a peak of the Seebeck coefficient coupled to a bump of the electrical resistivity, which may constitute a signature of a charge density wave instability

Mots-Clés: oxychalcogenides, non, stoichiometry

*Intervenant