

MS13-P7 Volatile heterometallic precursors for lithium ion battery cathodes. Evgeny V. Dikarev, Department of Chemistry, University at Albany, SUNY, Albany, NY, (USA)
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Development of lithium ion battery technology is largely attributed to the growing demand for smaller, more sophisticated and portable devices. Thin film batteries, composed of solid state materials that are only nanometers or micrometers thick, represent an improvement of the common rechargeable lithium ion battery technology in terms of safety, temperature stability, flexibility, and charge density. Volatile molecules that exhibit a facile thermal decomposition are ideal precursors for deposition of a thin film cathode material onto the current collector. However, controlled preparation of volatile lithium precursors represents a great challenge. It is well-established that lithium compounds with transition metals tend to form non-volatile coordination polymers or ionic frameworks. We report a new class of heterometallic compounds [1] that can be used as effective single-source precursors in the synthesis of cathode materials for lithium ion batteries. Lithium – transition metal β -diketonates are explored as volatile precursors suitable for MOCVD preparation of thin films and nanocrystals. We design heterometallic compounds that are stable, resistant to hydrolysis and exhibit clean, low-temperature decomposition pattern as well as proper metal ratio for the desired material. Diketonate precursors can be applied for the preparation of different types of cathode materials: oxides, silicates, and fluorides. Crystallographic aspects of heterometallic precursor structures will be discussed in details.

[1] Navulla, A., Huynh, L., Wei, Z., Filatov, A. S., Dikarev, E. V. (2012). *J. Am. Chem. Soc.* **134**, 5762-5765.

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MS13-P8 XRD analysis of superconducting MgB_2 prepared by Reactive Mg Liquid Infiltration process. Giovanni Giunchi,¹ Alessandro Figini Albisetti,¹ Alessia Aprea,² Luciana Malpezzi,³ Norberto Masciocchi,² Luca Bindi,⁴ ¹Edison S.p.A., R&D Division, Italy, ²Università dell'Insubria, Italy, ³Politecnico di Milano, Italy, ⁴Università di Firenze, Italy
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Polycrystalline MgB_2 superconductors can be obtained in a very dense form by an innovative pressureless process based on the Reactive Mg Liquid Infiltration on boron powders preforms [1]. Actually, the resulting superconducting material, well connected with respect to the superconducting currents percolation, is a composite material made by several interconnected phases: mainly MgB_2 with inclusions of Mg_2B_{25} [2], MgB_4 and metallic Mg. The presence of these inclusions is very dependent from the crystalline characteristics of the initial boron powders, from the process variables and from the presence of elemental carbon as atomic boron substitute. In order to correlate the superconducting properties with the nanosized interconnections of these phases, detailed XRD analyses, Electron Microscope and Atomic Force Microscopy imaging have been carried out. With XRPD the average dimensions of the crystallites have been determined and correlated with the process parameters. With Single Crystal X-Ray Diffraction on selected fine portions cut out of the material it has been possible to identify single crystal inclusions of the Mg_2B_{25} phase and their modification in presence of MgB_2 . Indeed we have found that the MgB_2 superconducting phase grows with different degree of crystallinity around, and inside, these inclusions. The phases morphology of the composite material, controlled at nano-size level by AF microscopy, confirms that inside the Mg_2B_{25} inclusions there are sub-micronic channels of MgB_2 , able to spread the superconducting current also through these not superconducting phase.

[1] Giunchi, G. (2003). *Int. J. Mod. Phys. B*, **17**, 453-460.

[2] Giunchi, G., Malpezzi, L. & Masciocchi, N. (2006). *Solid State Sciences*, **10**, 1202-1208.

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