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Impact of powder granulometry on the transport properties of Ba122 superconducting tapes

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The iron-based superconductor $Ba_{1-x}K_xFe_2As_2$ (Ba122), with a critical temperature around 38 K and a very high upper critical field (Hc2), is a promising candidate for high-field magnet applications, including those envisioned in future particle accelerator technologies. In this context, CNR-SPIN and CERN have initiated a joint collaboration—within the framework of the High Field Magnets (HFM) program—to investigate the potential of Ba122 for use in accelerator magnet systems.

Among iron-based superconductors, Ba122 stands out for its relatively low anisotropy, good grain connectivity, and compatibility with the Powder-In-Tube (PIT) wire fabrication method. However, the performance of PIT-processed conductors is strongly influenced by the properties of the precursor powders. Key parameters such as phase purity, grain boundary quality, and particle size distribution must be carefully controlled to ensure good mechanical workability and high critical current density.

This work presents an overview of the strategies adopted to tailor powder characteristics, with particular focus on particle size control via potassium excess in the starting mixture or by adjusting the granulometry of the metallic precursors (e.g., iron)[1]. These parameters significantly affect the final microstructure and, consequently, the transport properties of the wires. Our findings provide insights into process optimization toward the development of next-generation superconducting conductors for high-field applications.

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