

Superconducting solenoids for new applications in science and industry

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As main part of an ion-microbeam setup, superconducting solenoid lenses can make it a unique tool for research and development. The large angular acceptance of such an ion-optical system [1] with respect to conventional quadrupole configurations paves the way for industrial applications such as ion projection for rapid prototyping etc..

There have been two major obstacles for extensive use of this technology in the past: First, the difficulty and cost of on-site supply of LHe and LN₂ as cryogenic agents to cool the lens, and secondly the lack of possibility to obtain a commercial turnkey system, consisting of the lens, the beam-line components and, if desired, an appropriate accelerator.

The first problem can be solved by using a cryogen-free superconducting lens. Basic properties of such cryogen-free designs avoiding the -even intermediate-use of cryogenes will be sketched. The commercial availability of a turnkey system can be achieved when scientific knowledge and ACCEL's industrial production experience are combined. A set of options for the layout will be briefly discussed.

Material synthesis becomes possible due to high current densities. As an example, the maskless fabrication of SiC-microstructures will be shown [2].

- [1] J. Meijer, B. Burchard, K. Ivanova, B. E. Volland, I. W. Rangelow, G. Deboy; *High energy ion projection for deep ion implantation as a low cost high throughput alternative for subsequent epitaxy processes*; J.Vac. Technol. 22 –1 (2004) 152-157.
- [2] J.K.N. Lindner, S. Kubsky, A. Schertel; *Local composition analysis of SiC microstructures formed by ion projection in silicon using energy filtered TEM in combination with FIB specimen preparation*; Materials Science and Engineering B102 (2003) 70-74.