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## **Materials processing for building high field magnets**

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### **ABSTRACT**

Magnets with field up to 100-T require special materials for construction. The high fields impose very high stress on the materials. To ensure the physical integrity of a magnet under such high stress, both mechanical and physical properties have to reach certain designed values. To achieve the desired properties, special fabrication methods have to be used. The materials will be further processed when they are in service because of the high stress values imposed to them. Those special conditions introduce unusual property evolutions. Because the materials may operate at their plastic deformation range in high field and stresses may be different in different directions, it is sometimes also essential to design their properties anisotropy. In some cases, the materials deform plastically at cryogenic temperature and in a magnetic field. It is necessary to understand the influence of those experimental conditions on the property of the materials and to design/select materials that are able to be resilient at such environment. We will report several materials fabrication routes that are specially designed for magnet materials. We will also address the material characterization issues and the importance to relate the material properties to manufacture conditions.

**KEYWORDS:** high-strength materials, high magnetic field, high stress, high conductivity, fracture toughness, deformation, melting