

Latest Developments in Coated Conductors will Revolutionize Magnet Technology

Werner Prusseit, Veit Grosse, Markus Bendele, Oleksiy Troshyn

THEVA Dünnschichttechnik GmbH, Ismaning, Germany

Email: prusseit@theva.com

Abstract – The beginning commercialization of 2G HTS wire is largely driven by magnetic field applications. Hence, in recent years coated conductors (CCs) have been optimized for high field applications and have achieved a level of unparalleled critical current densities even in extremely high magnetic fields. Compared to pure ReBCO, by incorporating nanometer-size artificial pinning centers the engineering current density could be nearly tripled in magnetic fields and at temperatures below 40 Kelvin, exceeding the in-field performance of every other known superconductor material. This widely opens up the operation window for superconducting magnets with respect to temperature and field. At the same time the huge pinning forces, the higher heat capacity, and cooling efficiency changes the quench behavior of magnets and makes operation more benign and cooling less critical. Consequently, CCs will cause a revolution in magnet technology in the foreseeable future.

We will compare the latest improvements of coated conductors to conventional metallic superconductors and competing HTS and identify the most economic application scenarios for coated conductors.

Keywords (Index Terms) – Critical current, magnetic field, artificial pinning centers, coated conductor.

IEEE CSC & ESAS SUPERCONDUCTIVITY NEWS FORUM (global edition), December 2021.

Submitted November 14, 2021; Selected November 30, 2021. Invited presentation HF-8 given at CCA 2021, October 11 – 15, 2021, Virtual.