MT 26
International Conference
on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **1305** Type: **Poster Presentation**

Wed-Af-Po3.15-06 [10]: Research and development of future radiation resistant accelerator magnets based on high temperature superconductors

Wednesday, 25 September 2019 14:00 (2 hours)

A future accelerator facility to open up a new frontier will require a superconducting magnet with high radiation resistance. A construction plan of a second materials and life science experimental facility is proposed as one of the future plans of J-PARC. At the facility, superconducting solenoids are placed just behind the target to maximize the production of secondary particles. The absorbed dose of the superconducting magnet reaches 130 Gy in 10 years and the heating radiation is roughly estimated to be 650 W. In case of conventional NbTi based coils, it is difficult to keep the coil at superconducting temperature lower than 6.5 K due to heat load by the extremely high radiation. On the other hand, degradation of electrical insulation based on organic materials becomes conspicuous in this high radiation environment. Therefore, we have been performing research and development of mineral insulated superconducting magnets based on high temperature superconductors (HTS) to establish technology for a next generation radiation resistant superconducting magnet. In this contribution, results of applied research on ceramic coating and bonging technology to superconducting magnets, development status of the mineral insulated HTS coils, and results of irradiation test of HTS conductors and ceramic insulation samples will be presented.

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Session Classification: Wed-Af-Po3.15 - HTS Magnets and Conductors for Accelerators