



Contribution ID: 254 Contribution code: WED-PO2-116-05

Type: Poster

Development of Radiation-Resistant Warm Magnets using Cyanate Ester Resin

Wednesday 17 November 2021 10:30 (20 minutes)

We have been developing radiation-resistant warm magnets insulated by a Cyanate ester resin. We developed a glass fiber cloth prepreg tape using Cyanate-ester pre-polymers supplied by Mitsubishi Gas Chemical Corporation INC. The proton beam irradiation test was carried out for the evaluation of the radiation hardness. We prepared cured resin samples of Cyanate ester, Bismaleimide Triazine (BT), and epoxy resins using a same glass fiber cloth. The 70 MeV proton beam was irradiated to the resin samples up to 10^9 Gy at Cyclotron and Radioisotope Center, Tohoku University. The result of the tensile test after the irradiation showed that the radiation resistance of the Cyanate ester resin was almost same as that of the BT resin and more than 10 times as high as that of the epoxy resin. We also developed a Cyanate-ester putty to use in a coil molding. We performed a curing test of a coil mock up made of stacked hollow conductors insulated with the Cyanate-ester prepreg tape and putty. We successfully cured the coil mock up without causing thermal runaway.

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Session Classification: WED-PO2-116 Resistive accelerator magnets I