



Contribution ID: 609

Type: Poster Presentation of 1h45m

Development of a low temperature superconducting magnet with MgB₂ wire for a 10 kW DC induction furnace

Thursday, August 31, 2017 1:45 PM (1h 45m)

Generally, Nb₃SN and NbTi wires are used widely in superconducting applications. However, these wires are expensive and have low critical temperature (T_c of Nb₃SN=18 K, T_c of NbTi=9.8 K). To maintain the low-temperature condition, liquid helium is required continuously for cooling the wire and this causes lots of maintenance cost. However, MgB₂ wire has higher critical temperature than Nb₃SN and NbTi wires as 39 K. The MgB₂ wire does not need liquid helium and is able to make under the critical temperature condition using cryogen free cooling system such as conduction cooling system. Also, MgB₂ wire has an advantage of low price. Therefore, if we adopt MgB₂ wire to superconducting applications, we get advantages such as operating temperature, price, and cryogen free cooling system. In this paper, the authors develop a low temperature superconducting (LTS) magnet with MgB₂ wire for a 10 kW DC induction furnace. Firstly, a MgB₂ magnet is designed and analyzed using finite element method for a 10 kW DC induction furnace. Secondly, the magnet is fabricated using dry-winding method with metal insulation. Finally, MgB₂ magnet is assembled into the 10 kW DC induction furnace to evaluate its performance and characteristics. As a result, the MgB₂ magnet guarantees a satisfactory performance with low price and highest critical temperature among LTS wires. The low temperature as 20 K, which is the operating temperature of the MgB₂ magnet, can be achieved by a conduction cooling system. This study will be effectively utilized for a 300 kW DC induction furnace and other superconducting magnet applications.

Acknowledgements: This work was supported by the Power Generation & Electricity Delivery Core Technology Program of the Korea Institute of Energy Technology Evaluation and Planning (KETEP), granted financial resource from the Ministry of Trade, Industry & Energy, Republic of Korea. (No. 20142020103940)

Submitters Country

Republic of Korea

Primary authors: Mr LEE, Chankyeong (Changwon National University); Dr CHOI, Jongho (Supercoil Co., Ltd.); Mr CHO, Sangho (Supercoil Co., Ltd.); PARK, Minwon (Changwon National University)

Co-author: Prof. YU, In-Keun (Changwon National University)

Presenter: Mr LEE, Chankyeong (Changwon National University)

Session Classification: Thu-Af-Po4.07

Track Classification: E9 - Novel and Other Applications