

3D modeling of electromagnetic processes in induction system with cold crucible

I. Pozniak, A. Pechenkov, M. Kydryash, B. Nacke

Abstract

The cold crucible is a tool, which is used for induction heating applications for the high temperature synthesis of materials by middle or high frequency magnetic field. This crucible is made of sections assembled together to form the container in which the electrical conductive material is molten. The mathematical modeling of such geometrical complex configuration required 3D solution of electromagnetic problem. The model uses both a magnetic vector potential and electric potential “A and V” formulation. As results in the paper presents current spreading on the crucible sections, electric potential variation in the sections and the melt, information about the flash risks due to the voltage difference between the sections themselves or between them.

Authors

Dr. Pozniak, Igor,
Dr. Pechenkov, Andrey
Department of Electrotechnology
St. Petersburg Electrotechnical University
Prof. Popov str., 5
197376, St. Petersburg, Russia
E-mail: ivpozniak@mail.eltech.ru,
aypechenkov@mail.eltech.ru

Prof. Suvorov, Stanislav,
Zuev, Andrey
Department of High Temperature Materials
St. Petersburg State Technological Institute
Moskovsky pr., 26
198013, St. Petersburg, Russia
E-mail: av.zuev@mail.ru

Prof. Dr.-Ing. Nacke, Bernard,
Kydryash, Maxim,
Niemann, Benjamin
Institute of Electrotechnology
Leibniz University of Hannover
Wilhelm-Busch-Str. 4
D-30167 Hannover, Germany
E-mail: nacke@ewh.uni-hannover.de