Continuous melting and pouring of an aluminum oxide based melt with cold crucible

B. Nacke[1a], V. Kichigin[1b], V. Geza[1c] and I. Posniak[2d]

[1] Institute of Electrotechnology, Leibniz University of Hannover, Wilhelm-Busch-Str. 4, D-30167 Hannover, Germany

[2] St. Petersburg State Electrotechnical University, Prof. Popov str., 5, 197376, St. Petersburg, Russia

[a]nacke@etp.uni-hannover.de, [b]kichigin@etp.uni-hannover.de, [c]geza@etp.uni-hannover.de, [d]olin24@yandex.ru

TOPIC : 3. Electromagnetic melting,
a. Cold crucible

A distinctive feature of induction furnaces with cold crucible is skull melting without introduction any impurities in the melt and overheating of the melt over 3000°C at air. Therefore the technology of induction melting in cold crucible is suitable for high temperature synthesis of oxide materials. This paper describes a new technology for continuous melting and pouring of oxide melts. A new type of cold crucible with two chambers is used for this application. In the first chamber the charged oxide is melted and via a barrier transferred to a second chamber where the oxide is superheated before pouring over a discharging hole (Figure 1). During the transfer of the melted oxide from the melting zone into the superheating zone the transport of non-melted oxide particles has to be avoided. This transport is mainly influenced by the hydrodynamics of the melt flow and the temperature field during melting and pouring. Numerical simulation was used to investigate the heat and mass transfer during the melting and pouring process in the cold crucible. The simulation takes into account forced and free convection. Apart from the melt flow inside the cold crucible special attention is also paid to behavior of the pouring stream. The numerical results are compared with experimental data of melting and pouring experiments in the skull melting installation at the Institute of Electrotechnology in Hannover. The paper presents the cold crucible setup and first experiments, the results of the numerical simulation and the comparison with experimental data.

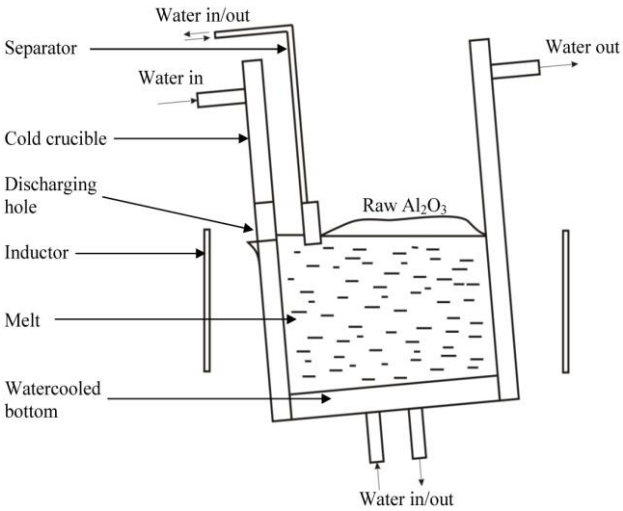

Figure 1. Cold crucible for continuous melting and discharging of oxide melt