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# Homogenisation of Electrically Heated Glass Melts by Lorentz Forces

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Key words: glass melts, homogenisation, Lorentz forces Abstract: In contrast to liquid metals which are generally turbulent, in glass melts occur only slow laminar flows due to their high viscosity and small Reynolds numbers ($Re \approx 1$). To obtain sufficient homogeneity plenty of time is required for processing. It is well known that the refining and mixing of glass can be supported by additional direct electrical heating. This causes stronger buoyancy due to the resistive heating of the melt mainly near the electrodes and enhances the temperature gradients. In addition to that, an imposed magnetic field perpendicular to the electric field generates Lorentz forces, which reinforce or counteract the temperature gradient driven convection. This work investigates the utilisation of this effect for the homogenisation of glass melts. We have performed several experiments characterized by different values of the heating electrical current and the intensity of the magnetic field in order to systematically study the influence of Joule heat and Lorentz forces on the homogeneity of glass melts. The investigation of material from specimens showed an improved homogeneity as a result of similar optical and physical properties. To verify the findings of the hot experiments we have also analysed model fluids at low temperatures to get visible information about the convective flow. Furthermore, numerical simulations and analytical modelling complete the research. The use of mixing effects caused by electromagnetic stirring may lead to new applications of magnetofluiddynamics in glass technology.

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