

Electrical evaluation of molten lithium niobate using floating zone furnace

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The electrical evaluations of the molten oxides, from which the crystals were grown, are thought to be powerful tool to investigate the transport phenomenon and interfacial phenomenon between the melt and the crucible material⁽¹⁾. These evaluations were essentially important for growing high quality single crystals. In this paper, the electrical properties of the high temperature LiNbO_3 melts were measured using a modified floating zone furnace. Thermoelectric power due to the temperature difference at the Pt electrodes was clearly observed for the molten LiNbO_3 under various conditions of O_2 concentrations in atmosphere.

In order to measure the electrical properties of the molten LiNbO_3 , a floating zone (FZ) furnace has been modified (**Fig. 1**) (Crystal System Co. Japan)⁽¹⁾. The Pt plates and Pt wires are used as the electrodes. Non-doped congruently melting LiNbO_3 was used as the specimens. Electrical conductivity was measured using Kethley 6517A type electrometer.

The molten LiNbO_3 is suspended by the two Pt electrodes (**Fig. 2**). The shapes of the melts was observed using CCD camera system attached to the FZ furnace.

The voltage-current (V-I) curve was measured with applying the voltage from about -1 V to 1 V (**Fig. 3**). Thermo-electric power was estimated from the I-V curves using the bias voltage at current of 0 mA. Similar thermoelectric power is observed in all the LiNbO_3 specimens. The electrical resistivity of molten LiNbO_3 increases with O_2 concentration of the atmosphere.

Reference

1) "Electrical measurement of molten TiO_2 using floating zone furnace", T. Katsumata, T. Shiina, M. Shibasaki and T. Matsuo, *J. Crystal Growth* 237-239 (2002) 1791-1796.

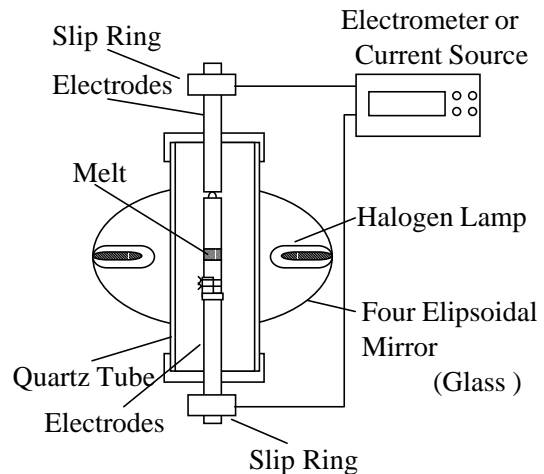


Fig. 1. Electrical evaluation equipment of molten LiNbO_3 using floating zone furnace. Electrodes are modified as shown in Fig. 2.



Fig. 2. Droplet of molten LiNbO_3 supported by Pt electrodes in FZ furnace. Thermocouples are located near the electrodes.

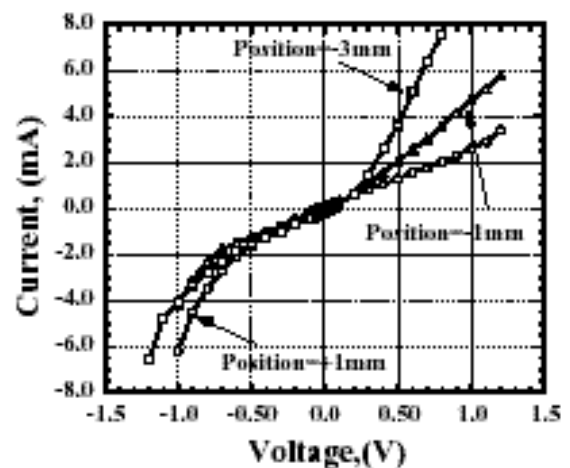


Fig. 3. I-V curve for molten LiNbO_3 droplet at various position in the FZ furnace. Temperature difference between electrodes varies at the position in the furnace.