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**Development of Natural Convection Heat Transfer Correlation
for Liquid Metal with Overlying Boiling Coolant**

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Abstract

Experimental study was performed to investigate the natural convection heat transfer characteristics and the crust formation of the molten metal pool concurrent with forced convective boiling of the overlying coolant. Tests were performed under the condition of the bottom surface heating in the test section and the forced convection of the coolant being injected onto the molten metal pool. The constant temperature and constant heater input power conditions were adopted for the bottom heating. Test results showed that the temperature distribution and crust layer thickness in the metal layer are appreciably affected by the heated bottom surface temperature of the test section, but not much by the coolant injection rate. The relationship between the Nu number and Ra number in the molten metal pool region is determined and compared with the correlations in the literature, and the experiment without coolant boiling. A new correlation on the relationship between the Nu number and Ra number in the molten metal pool with crust formation is developed from the experimental data.