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Improved wetting of Al_2O_3 by molten Sn with Ti addition at 973-1273 K

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Abstract

Wetting of polycrystalline Al_2O_3 by molten Sn-(2, 5 at.%) Ti alloys using modified sessile drop method under high vacuum at 973-1273 K was studied. Ti addition can improve wettability definitely without the precipitation of the continuous reaction layer. The wetting mechanism should be mainly ascribed to Ti adsorption that induced the decrease of liquid/solid interfacial free energy. The statistical thermodynamic model was used for the prediction of final contact angles and satisfied the experimental results. Spreading dynamics were controlled by the adsorption dynamics in the most of the range. The description of adsorption or reaction controlled spreading model has almost the same expression, but the activation energies of adsorption wetting are much smaller than that of reaction product controlled wetting.

Keywords: wetting; spreading; reaction; adsorption; interface.