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Interface reactions between rutile coatings and molten aluminium or AlSi7Mg0.6 alloy

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Abstract

Rutile coatings deposited on corundum substrates are considered as promising functional elements improving the efficiency of the filtration of oxide inclusions out of aluminium melts. This contribution describes the reactions between rutile and two kinds of the aluminium melts and discusses the consequences of these reactions for the filtration process. It was found that the contact of rutile coatings with molten aluminium leads to the formation of a corundum layer at the solid/liquid interface. The exposure of the rutile coatings to molten AlSi7Mg0.6 alloy produces an interface layer of MgTiO₃. The interface layers possess defined orientation relationship to rutile which is characteristic for locally heteroepitaxial growth. The density functional theory calculations revealed that the TiO₂/α-Al₂O₃ and TiO₂/MgTiO₃ interfaces with the orientation relationships observed experimentally have low interface energies. The

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