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Application of solid electrochemical sulfur sensor in the liquid iron

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Highlights

- A novel sulfur sensor was designed based on $ZrO_2(MgO)$ as solid electrolyte and $CaAl_2O_4+CaAl_4O_7$ as electrode coating.
- In situ formation of $CaAl_2O_4+CaAl_4O_7+CaS+Al_2O_3$ auxiliary electrode
- Fast response time and small measurement errors.
- Application well in the liquid iron.

Abstract

A novel solid electrochemical sulfur sensor based on $ZrO_2(MgO)$ as solid electrolyte and $CaAl_2O_4+CaAl_4O_7$ as electrode coating was developed and tested in the carbon-saturated liquid iron at 1773 K. A mixture of chromium and chromium oxide was used as the reference electrode, CaS was allowed to synthesized in situ during the measurement by the $CaAl_2O_4+CaAl_4O_7$ coating on the surface of $ZrO_2(MgO)$ solid electrolyte to form the auxiliary electrode with residual $CaAl_2O_4$ and $CaAl_4O_7$ phase based on the reactions: $CaAl_2O_4+[S]=CaS+Al_2O_3+[O]$ and

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