Séminaire de Ashok DAS

Jeudi 26 janvier à 11h | Thursday, January the 26th, 11AM
Salle 4-A014 | Room 4-A014
Institut Jean Lamour, Campus ARTEM

Evolution of inclusion population in homogeneous gas-stirred ladle: a multi-variate modeling approach

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Achieving high mechanical performance in metallic materials requires precise control of the inclusion population, and the treatment of liquid steel in gas-stirred ladles is crucial for inclusion cleanliness in specialty steels. Tracking the inclusion properties, such as size, chemical composition, etc. is crucial in modeling of inclusion behavior in liquid metal treatment. A comprehensive multi-variate population balance model (PBM) is developed to track the temporal evolution of the inclusion population inside the ladle. The model is developed by incorporating micro-mechanisms such as aggregation of inclusions, upward sedimentation of inclusions, flotation of entrapped inclusions at the surface of the bubbles, and capture of inclusions at the top slag. The model is solved using a weighted finite volume scheme to predict the chemical heterogeneity of inclusions. The simulation results, when applied to an industrial gas-stirring ladle operation, show the efficiency of this modelling approach and allow us to compare the respective roles of different mechanisms on the inclusion removal rate. Furthermore, the PBM has produced new results for multi-component inclusion system, including the distribution of inclusions with respect to their chemical components.