# A Model of Condensation and Solidification of Metallurgical Vapor in a Supersonic Nozzle

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**Abstract :** A one-dimensional model for the simulation of condensation and solidification of a metallurgical vapor in the mixture of gas during supersonic expansion is presented. In the model, condensation is based on critical nucleation and drop-growth theory. When the temperature falls below the supercooling point, all the formed liquid droplets in the condensation phase are assumed to solidify at an infinite rate. The model was verified with a Computational Fluid Dynamics simulation of magnesium vapor condensation and solidification. The obtained results are in reasonable agreement with CFD data. Therefore, the model is a promising, efficient tool for use in the design process for supersonic nozzles applied in mineral processes since it is faster than the CFD counterpart by an order of magnitude.

**Keywords :** condensation, metallurgical flow, solidification, supersonic expansion

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