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**THE MELTING ABLATION ANALYSIS OF AEROLITES IN HIGH TEMPERATURE FLOW**

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##### ABSTRACT

The atmosphere of earth is a natural protection layer from the NEO. When the objects enter the atmosphere with extreme high speed, their kinetic energy are converted to the internal energy by the shock compression and the wall frictions. The aero thermal usually cause the objects ablate and disintegrate. Considering most aerolites found on the ground are in silicate materials and the ablation simulations for these materials during entering earth atmosphere is needed by the risk assessment.

The steady incompressible flow equations for the boundary layer are established to depict the phenomena of heat transfer and fusion flow. Through magnitude analysis and linear simplification, the formula for the ablation rate is addressed. Numerical analysis is present for the basalt /aerolites ablation experiments in arc jet that are carried out at CARDC. Based on the aerodynamic force and thermal environment supplied by CFD simulations, the mass loss mechanism of evaporation and moving molten layer driven by surface shear force and pressure gradient are considered. The simulation results show that the depth of melting layer is extreme thin and sensitive to the viscosity coefficient. The mass loss due to evaporation is the main part at high status, while molten layer flow plays a more important role at low status. The surface temperature and local ablation rate are consistent with the measured data, and shape change is also addressed through three dimensions surface mesh.

Finally, the thermal stress status is investigated under the aero thermal loads and the stress concentration locations where the model may break during experiments are addressed.

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***Comments:***

*Oral session is preferred.*