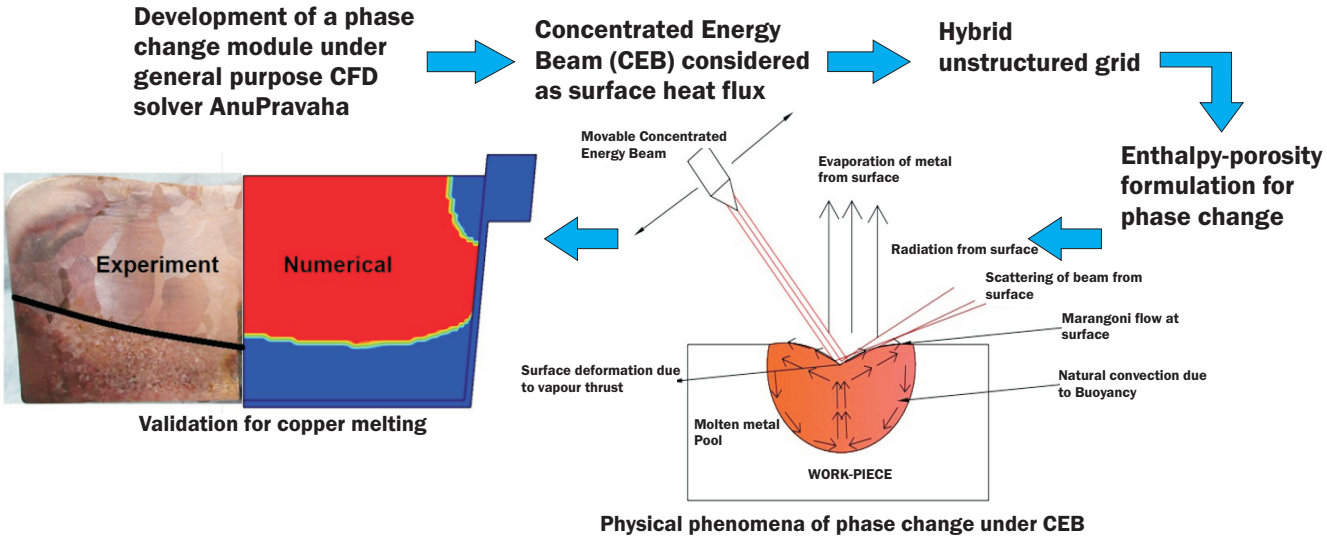
# *Development of a Phase Change Solver and its Application to Concentrated Energy Beam*

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A phase-change computational fluid dynamics (CFD) solver module was developed for the numerical solution of melting, solidification and evaporation of any substrate under a concentrated energy beam (CEB). A fixed grid enthalpy-porosity technique was used to capture the phase change phenomena. CEB was implemented as a surface heat flux boundary conditions. Various associated phenomena like Marangoni flow and natural convection was studied for laminar flow regime. The numerical solver was validated for melting of copper and melting and evaporation of tin under a 270° bend pencil Electron Beam Gun (EBG) evaporator. The numerical solutions from the solver were found to be in very good agreement with experimental results with less than 5% deviation. The results were reported in a recent publication (Mazumder *et al.*, *Int. Commun. Heat Mass Transf..*, 2021, **126,** 105469). A case study was carried out using the validated solver for maximizing the molten pool fraction in the evaporator system for laser based purification processes. It was observed that for the particular geometry of the evaporator, the variation in the aspect ratio improves the molten pool fraction significantly.

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