Computational modelling of industrial operations involving multi-physics and multi-scale processes

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ABSTRACT:
Industrial operations in materials and metals processing frequently involve interactions amongst a range of physical phenomena. Sometimes these phenomen might be very distinctive (e.g. fluids interacting with structures) and in others they might involve similar phenomena (e.g. thermal fluid flow) but over a range of length and time scales.
The modelling of these multi-physics and multi-scale phenomena always seem to occur in complex geometries in real industrial problems. As such, their solution requires sophisticated computational procedures embedded within appropriate software technologies.
Because of the heavy compute challenges associated with these kinds of simulation then ideally one would want to make use of high performance parallel computer systems in generating solutions within practical time frames.
This presentation will discuss the challenges of multi-physics and multi-scale modelling of industrial problems. In so doing a description of one computational modelling approach will be outlined and exploited in the analysis of a range of multi-physics and multi-scale industrial processes, including granular flows in hoppers, alloy segregation during solidification, metals extrusion and heap leaching of ores.