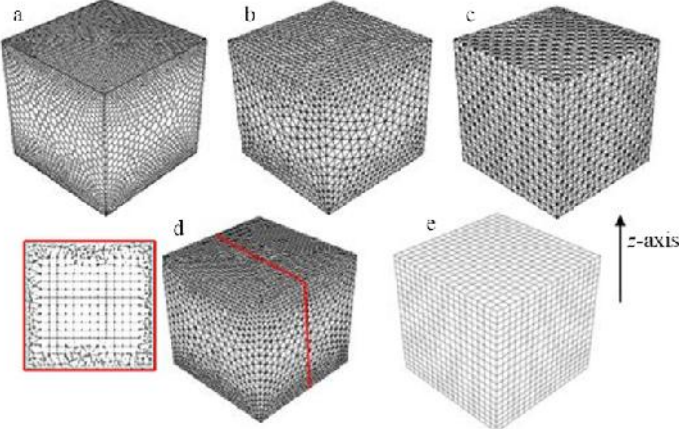


SUpport to SAfety ANalysis of Hydrogen and Fuel Cell Technologies

Verification type	Numerical Solution
Database reference	NUM-2
Topic / Application	Hydrogen release, Nuclear
Physics	Momentum, diffusion release, stratification
Summary	Verification of numerical modelling approach to LOWMA-3 experiment at MISTRA facility via two CFD codes
Description	<p>This paper undertakes verification of two CFD codes which are used to model the LOWMA-3 experiment performed at the MISTRA facility at CEA, France. A key aspect of this experiment is that momentum transport and molecular diffusion contribute equally to the diffusion process i.e. $Fr \approx 1$. The practical application of the experiment is hydrogen release during nuclear containment scenarios.</p> <p>While most of the paper deals with appropriate model choice and hence is validation, the authors compare the modelling results of two codes – a commercial code (Fluent) and an in-house code (Trio-U). The authors believe that the staggered mesh arrangement (for storing field variables) is better able numerically to deal with velocity/pressure coupling and concentration stratification. The paper also utilises best practice guidelines for CFD in Nuclear Reactor Safety.</p>
Case Title	SIMULATION OF LOWMA-3 MISTRA EXPERIMENT
Authors	<i>Ishay L., Ziskind G. and Rashkovan A, Bieder U. and Brinster J</i>
Year	2012
Online reference	ulrich.bieder@cea.fr

<p>Case image</p>	 <p>Spurious velocity and mesh dependence study</p>
<p>Governing equations</p>	<p>N/A</p>
<p>Results</p>	<p>The paper reports on poor accuracy resulting from mesh topologies, and from discretisation / interpolation schemes.</p> <p>A key insight is that spurious velocities arising from mesh topologies and poor mesh quality can be of the order of diffusion velocities and where $Fr \approx 1$ this will lead to poor accuracy.</p> <p>Tetrahedral meshes show poor representation of diffusion due to cell faces being unaligned with concentration and buoyancy gradients.</p> <p>The paper follows a good process for verification in separating the separate mixing effects before combining them into a single model. The rationale behind the chosen modelling approach, including mesh topology, turbulence modelling and various numerical parameters, has been established based on the separate effect studies.</p>