



HAL
open science

Glass melting and phase separation: Modeling and simulation approaches

Sophie Schuller, Emilien Sauvage, Kolani Paraiso, Alain Cartalade, Werner Verdier, Stéphane Gosse, Romain Le Tellier

► **To cite this version:**

Sophie Schuller, Emilien Sauvage, Kolani Paraiso, Alain Cartalade, Werner Verdier, et al.. Glass melting and phase separation: Modeling and simulation approaches. gomd, May 2022, BALTIMORE, United States. <cea-04676188>

HAL Id: cea-04676188

<https://cea.hal.science/cea-04676188v1>

Submitted on 23 Aug 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

Glass melting and phase separation: Modeling and simulation approaches

S. Schuller¹, E. Sauvage¹, K. Paraiso², A. Cartalade³, W. Verdier³, S. Gosse³, R. le Tellier⁴

¹DES, ISEC, CEA, University Montpellier, F-30207, Bagnols-sur-Cèze Cedex, France

² Saint Gobain Research Provence, Cavaillon F-84300

³DES, ISAS, CEA, University Paris-Saclay, F-91191, Gif-sur-Yvette, France

⁴DES, IRESNE, CEA, Cadarache, Saint-Paul-lez-Durance F-13115, France

Highly focused research programs on nuclear waste vitrification are still underway in the “Science and Technology Institute for Circular Economy of Low Carbon Energies” (CEA/ISEC). The main issues facing us today are to accommodate new types of wastes and higher waste loading, while enhancing the glass quality and increasing the production capacity and robustness of plants. This requires an extensive knowledge on glass melting processes and physical-chemistry of vitreous materials. Basic research supported by a modelling approach is conducted from laboratory-scale and mock-up, to full-scale non-radioactive facilities. This talk will be focused on an academic research conducted to model the glass melting process and the phase separation mechanism in the melt. First a modelling approach able to couple reaction kinetics laws of thermally activated glass melting processes (denitration, crystallization, dissolution) to a magneto-thermo-hydraulic model will be presented. One example of simulation integrating the chemical equation and solved with CFD tools will be presented. Second, we will focus on the phase-field model for the simulation of phase separation mechanism in a ternary phase diagram coupled with real thermodynamic landscape and Navier-Stokes equation.