

DEN: Thesis SL-DEN-20-0084

RESEARCH FIELD

Electromagnetism - Electrical engineering / Engineering sciences

TITLE

Study of glass metal liquid bath behavior under low frequency induction

ABSTRACT

PIVIC process developed by CEA for ORANO achieves, in one step, treatment of radioactive material of various composition. Organic part is incinerated by oxygen plasma in order to respect storage requirements. Metallic and ceramic parts are melted together in a melting unit by low frequency induction.

Low frequency induction provide efficient heating of metallic materials until melting and generate electromagnetic stirring in molten metal. Melting process developed at CEA involve a second molten phase of glass above metal for radionuclides stabilization. Metallic parts of the waste melt with inductive heating in order to reduce their volume. Modeling of biphasic system is essential to estimate power required for heating and stirring of metallic phase. Thermal and motion transfers study give information about operating parameters in order to improve transfer through interface and allow heating and stirring of glass from metal phase. Chemical reactions between both phases could be evaluated by this model for different conditions of inductive system.

Electromagnetic, thermohydraulic and thermodynamic and/or chemical equilibrium are involved in the melting process description. This PhD work will enhance modeling skills of the candidate. Model coupling and parametrization are the main objective of the proposed work. Skills developed during this PhD could be proposed to nuclear, glass or metallurgical industries

LOCATION

Département de recherche sur les technologies pour l'enrichissement, le démantèlement et les déchets

Service d'études de vitrification et procédés hautes températures

Laboratoire des procédés thermiques innovants

Place: Marcoule

Start date of the thesis: 01/10/2020

CONTACT PERSON

Patrice CHARVIN

CEA

DEN/DE2D//LPTI

CEA Marcoule

Bat 208

BP 17171

30207 Bagnols sur Cèze Cedex

Phone number: +33 4 66 79 16 83

Email: patrice.charvin@cea.fr

UNIVERSITY / GRADUATE SCHOOL

Grenoble INP

IMEP2: Ingénierie - Matériaux - Environnement - Energétique - Procédés - Production

THESIS SUPERVISOR

Annie GAGNOUD

CNRS

SIMAP-EPM

Laboratoire SIMAP/EPM

1340 rue de la Piscine

38402 Saint-Martin-d'Hères