Université catholique de Louvain
UCL
SECTEUR DES SCIENCES ET TECHNOLOGIES
INSTITUTE OF MECHANICS, MATERIALS AND CIVIL ENGINEERING

Invitation à la soutenance publique de thèse

Pour l'obtention du grade de Docteur en Sciences de l'Ingénieur

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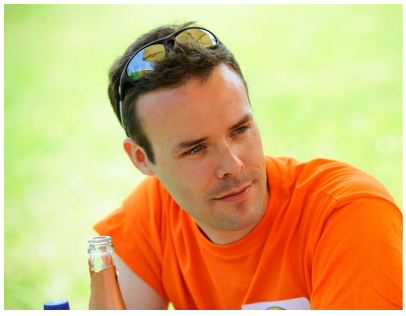
Experimental and modelling investigations on droplet entrainment in a PWR hot leg under stratified flow conditions

In a world where climatic and environmental issues are questioning the energy policies every day, the nuclear energy has to overcome the safety challenges to prevent severe accident and to eventually keep a place in the world future energy mix. In this context the ability to accurately predict the behavior of a PWR nuclear reactor undergoing a severe accident is a key parameter of the dimensioning of the safety systems.
This work focuses on a still understudied phenomenon occurring during the most severe accident, the Loss Of Coolant Accident. A LOCA accident is characterized by the appearance of a large break in the PWR primary circuit, inducing the loss of the water coolant and the depressurization of the circuit. This depressurization induces the coolant vaporization and the emergence of a liquid dispersed phase, as droplets. During several phases of a LOCA, the droplet behavior may interfere in the core reflooding process, through the mass transfers and the pressure balance perturbations induced by their vaporization, entrainment and deposition. The present work aims at characterizing the droplet entrainment at the liquid-vapor interface of the stratified flow that may appear in the PWR hot legs during LOCA accidents.
The original scientific contributions of this work include the development of a droplet entrainment model in a stratified flow configuration where no existing models were relevant and the complete theoretical description of the phenomenon sequences leading to this droplet entrainment. The experimental validation of the model has been achieved on the REGARD facility at CEA Grenoble, leading to a complete characterization of the droplets in an horizontal pipe at a 1/3 scale of a PWR hot leg. Finally, although there is no existing database of the droplet entrainment rate during a LOCA, the proposed model predicts an entrainment rate of a correct order of magnitude compared to the experimental results, contrarily to most existing models.

Mardi 23 aout 2016 à 16h00

Auditoire SUD 01
Place Croix du Sud
1348 Louvain-la-Neuve



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