

## Bubbles dynamics under pool scrubbing conditions for iodine compounds trapping applications

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### Abstract

Accident management systems are highly regarded in the designing of nuclear power plants, in order to mitigate as much as possible the consequences of hypothetical severe accidents. Wet FCVS is one of these systems that aims to trap fission products transported in a carrier gas, such as iodine, by bubbling in a liquid pool (pool scrubbing phenomenon) [1]. This process contributes to avoid these fission products releases to the environment and thus to limit the radiological consequences of the accident. Pool scrubbing may also occur in SGTR accidental situation (with flooded steam generator).

Relying on set of bubble dynamics and retention mechanisms, it is essential to characterize the relevant hydrodynamics parameters in pool scrubbing conditions, for the development and assessment of accurate models able to predict contamination transfer. Indeed, injecting air at high flow rates induces bubble-bubble interactions which provoke random formation of bubbles affecting their size, shape, and frequency of bubbling.

Experimental work is carried out to reveal the impact of these interactions on the formation of bubbles at a submerged orifice [2]. Based on the different bubble's morphologies that have been observed, we first investigated the bubble-bubble interactions in the injection zone and then classified different bubbling regimes depending on the position of bubbles' coalescence. The biggest bubble formed above the orifice, after the coalescence of bubbles, is referred by a globule. On the basis of this morphological description of bubbles throughout our experiments, two approaches in characterizing the bubbles sizes were developed. The first conventional approach is based on the assumption of single bubbling formation and spherical shape of bubbles. However, this approach is not consistent with flow morphology experimentally observed. Therefore and through a proposed phenomenological approach, we aimed to characterize experimentally the globule size and frequency, through image processing. The globule sizes are found to be generally larger than sizes determined by the classical approach, showing a weak applicability of literature models to predict bubbles size at high Weber number in the injection zone of such flows.

In parallel, decontamination factors (DF) for iodine compounds are experimentally determined, in order to be able in the long term to correlate iodine trapping with hydrodynamics considerations.

**Keywords:** Pool scrubbing, bubble dynamics, globule volume, decontamination factor

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