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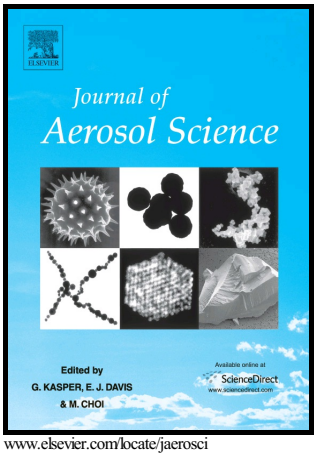

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PII: S0021-8502(17)30397-X
DOI: https://doi.org/10.1016/j.jaerosci.2018.03.005
Reference: AS5266

To appear in: *Journal of Aerosol Science*

Received date: 10 October 2017
Revised date: 2 January 2018
Accepted date: 29 March 2018

Cite this article as: C. Kaltenbach and E. Laurien, CFD Simulation of Aerosol Particle Removal by Water Spray in the Model Containment THAI, *Journal of Aerosol Science,* https://doi.org/10.1016/j.jaerosci.2018.03.005

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Abstract

A spray system in the upper containment part of a PWR (Pressurized Water Reactor) is an effective mitigation mechansim to reduce the spread of radioactive particles inside the reactor building. Radioactive particles and hot water steam can be released out of a leak in the primary circuit during a severe accident. CFD (Computational Fluid Dynamics) simulation of spray is a challenging task in the field of nuclear reactor safety. To use commerical codes like ANSYS CFX for flow analysis in nuclear reactor safety, user defined physical models must be implemented to investigate relevant thermohydraulic physical phenomena like heat and mass transfer between droplets and the atmosphere. In the current publication a CFD model is presented, which is able to describe the extraction of aerosol particles in an atmosphere by water spray. The model is applied in ANSYS CFX 16.1 and is compared to experimental data of AW4, which was performed in the German model containment THAI (Thermal-hydraulics, Hydrogen, Aerosols and Iodine). During the experiment, a spray is injected into THAI to reduce the particle content in an aerosol atmosphere. Particle concentrations at different measure planes in THAI are used for comparison with simulations. Simulations use different droplet and particle size groups (mono- and polydisperse) in a full three dimensional geometrical mesh of THAI. Each size class is modeled by a seperate velocity field.

Keywords

Two-phase flow, Containment flow, THAI, CFD, Aerosol, Spray