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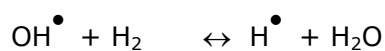
Séminaire DEN/DPC/SCCME-DSM/IRAMIS/LSI

## **Modelling the critical hydrogen concentration in PWR**

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Bartels (Notre Dame University, USA) and Elliot (AECL (Canada) have recently re-evaluated the high temperature primary yields and rate constants for the molecular and radical products of water radiolysis<sup>1</sup>. These have been included in a chemical model and used to simulate the AECL (Canada) tests to measure the critical hydrogen concentration (CHC) below which net radiolysis of water occurs in nuclear Pressurised Water Reactors. A simple sensitivity study has been carried out using the model.

It was found that the only major sensitivity in the set of rate constants was for the forward and back reactions involving the hydroxyl and hydrogen radicals:



The model predictions are not particularly sensitive to dose-rates, but are sensitive to the ratio of primary yields of molecular to radical radiolysis products. Whilst the primary yields for gamma radiolysis products are reasonably well known, those for neutron radiolysis in solutions of low solute (scavenger) concentration, appropriate to conditions at the CHC, are not.

The results from the sensitivity study will be described.

In order to fully understand water radiolysis in nuclear reactor conditions, the primary yields for neutron radiolysis as a function of scavenger concentration are required.

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<sup>1</sup> AJ Elliot and DM Bartels, "The Reaction Set, Rate Constants and g-Values for the Simulation of Radiolysis of Light Water over the Range 20° - 350°C Based on Information Available in 2008", AECL report, 153-127160-450-001, 2009.