Advanced Characterization Methods for Study of Austenitic Stainless Steels Exposed to Supercritical Water

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Abstract. The last two decades of nuclear material research shed light on the understanding of various engineering issues. The knowledge obtained from numerous theoretical and experimental studies enabled a much more comprehensive interpretation of results from many analytical techniques, including positron annihilation spectroscopy. This contribution provides an overview of recent results obtained from positron annihilation experiments that were conducted to characterise the ageing of structural materials exposed to harsh corrosion environments expected in the next generation of nuclear reactors. Applying techniques based on slow positron beams revealed a new potential for characterising corrosion processes in austenitic stainless steels, including alumina-forming alloys. The obtained data support the conventional SEM-EDS characterisation of the corrosion layers and demonstrate a new approach for studying materials exposed to challenging radiation, chemical and thermal environments.

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