CHEOPS2

Chemistry Of Primary System

Study of the behavior of materials and chemical species in the primary circuit of NPP from the source term to the sink term.

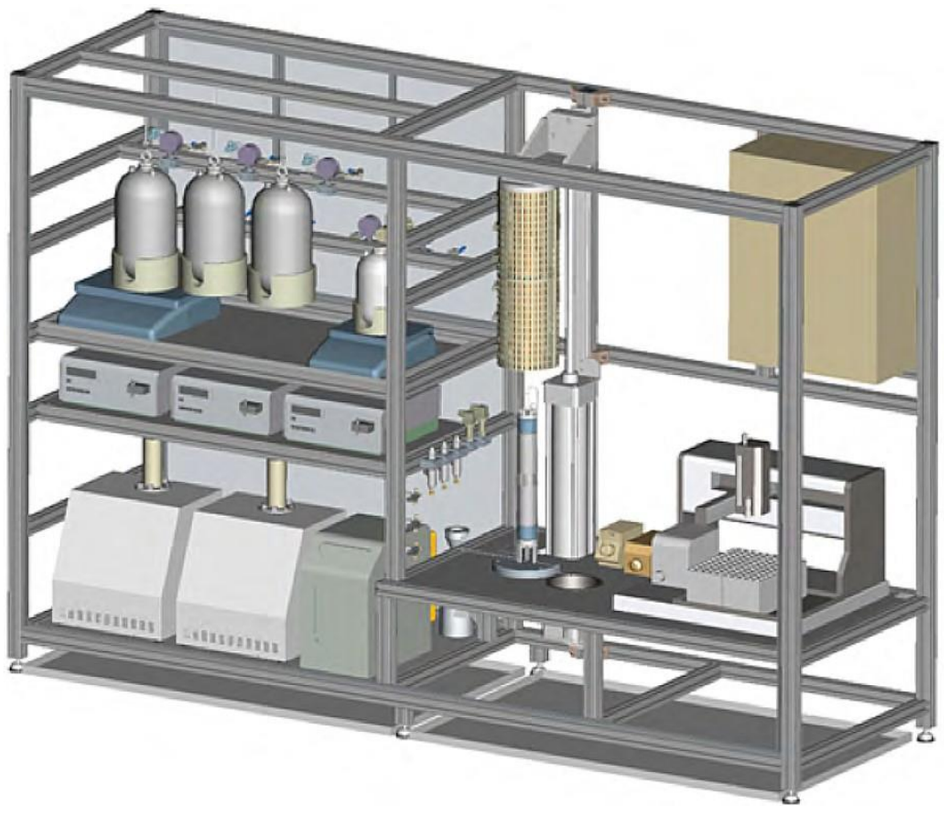
The chemical reactions that occur between species (temperature effect, radiolysis …) or in contact with materials (corrosion of Steam Generator Tubes, deposits, purification…) are evaluated theoretically and through experimental studies in the representative conditions of the primary circuit (through the different MAI experimental loops)

BOREAL experimental loop for the study of release phenomena

TITANE experimental loop for oxidation

Objectives:

- Optimization of the chemistry of the primary system,
- Reduction of the personal exposure of the primary circuit through a better control of the contamination,
- A better knowledge of the phenomena, which reduce the plant's availability.



SOLO loop

FIVE main R&D axes:

- CORROSION AND RELEASE PHENOMENA OF STEAM GENERATOR TUBE (main contributor to the contamination): research of chemistry strategies for surface passivation, development of model related to release phenomena in order to simulate further, what is expected on plants.
- THERMOCHEMISTRY AND SPECIATION: the goal is to improve the fundamental data and to provide reliable database inputs used in code calculation (like MulteQ). This concerns especially the different species, which have been identified as potential issues during operation or shutdown conditions like Antimony, Silver or Iodine. A special focus is also made on the understanding of the Ni and other Corrosion Products dissolution/precipitation mechanisms (studies based on solubility Measurements using an experimental loop named SolO).
- ZINC INJECTION: the goal is to identify Zinc's mechanisms on fuel deposits and chemical levers, which can impact deposition phenomena (to reduce risk of CIPs), and the impact of Zinc injection on release.
- PARTICULATE FORMATION AND DEPOSITION: the goal is to have a better understanding of particulate formation and deposition to identify strategies to proactively prevent either formation or depositions and thus enable the removal of the radiation field source term.
- RADIOLYSIS: Corrosion models showed slight discrepancies with measured corrosion in reactor under normal operating conditions. The impact of additional mechanisms acting on corrosion has thus to be considered to better describe the corrosion in calculation models. The impact of Hydrogen concentration on oxidizing species is also studied.