

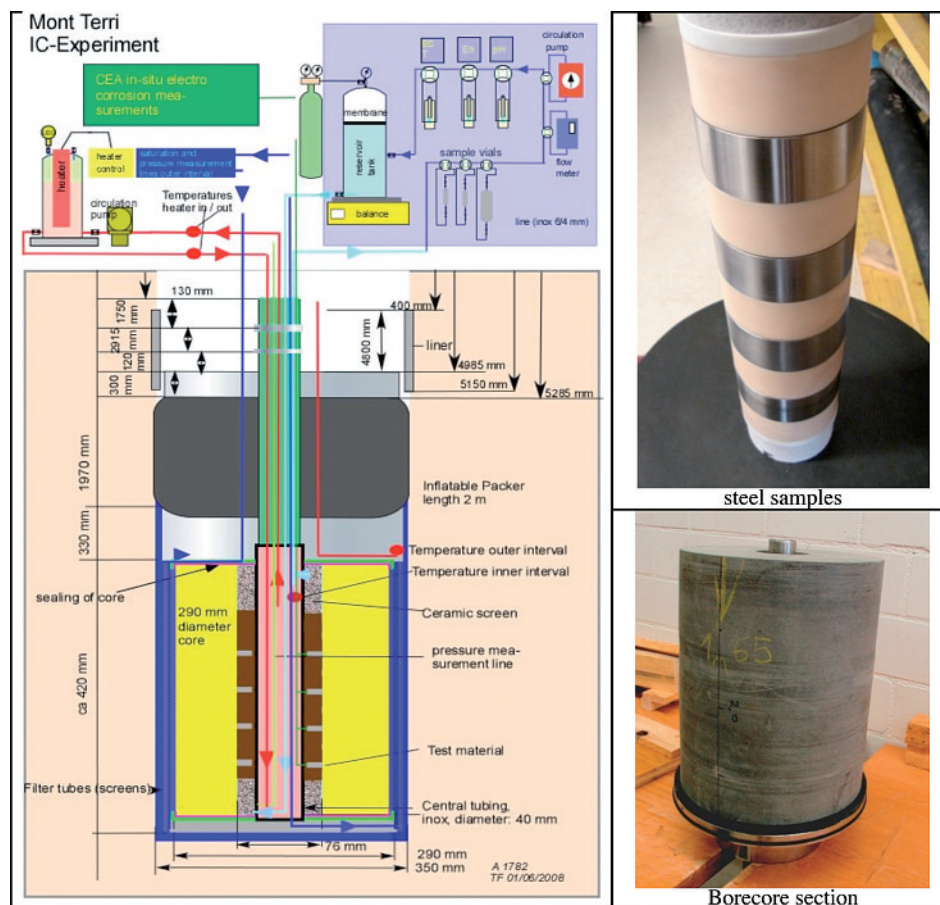
# IN SITU CORROSION MEASUREMENTS BY ELECTROCHEMICAL METHOD (IC EXPERIMENT) AT MONT TERRI

S. Dewonck<sup>1</sup>, C. Bataillon<sup>2</sup>, D. Crusset<sup>3</sup>, B. Schwyn<sup>4</sup> and N. Nakayama<sup>5</sup>, G. Kwong<sup>6</sup>

1. Andra CMHM, RD960, F-55290 Bure, France (sarah.dewonck@andra.fr)
2. CEA/DEN/DANS/DPC/SCCME/LECA Bât 458, F-91191, Gif/Yvette, France
3. Andra F-92298 Châtenay-Malabry Cedex, France
4. NAGRA, Hardstrasse 73 CH-5430 Wettingen, Switzerland
5. JAEA, 959-31, Jorinji, Izumi, Tokishi, Gifu 509-5102, Japan
6. NWMO, Toronto Ontario, M4T 2S3 Canada

The study of the interactions of steel pieces with an argillaceous rock is the aim of the IC experiment carried out in the Mont Terri Rock Laboratory (Switzerland).

More precisely, the IC experiment consists in monitoring the corrosion rate of various steel (Inconel 690, 316L stainless steel, 2 carbon steels one representative of Andra concept and another of Nagra concept) at 80°C, in an anaerobic condition, in contact with the Opalinus clay formation. The corrosion rate monitoring is based on Electrochemical Impedance Spectroscopy (EIS). This method is not disturbing for the corrosion process i.e. the corrosion rate doesn't change during the electrochemical measurement. The main drawback of this method is that the corrosion process must be in stationary or quasi stationary state: EIS can only measure corrosion rates which do not change quickly with time. This method is well adapted for long term corrosion monitoring because long term corrosion rate evolves slowly.



**Figure 1:** Experimental setup.

A special design of the experimental setup (Figure 1) was developed to allow optimal interactions between rock and steel samples. It consists in mounting the steel samples inside of a borecore section. This section is then placed at the extremity of the borehole equipment. The equipment is inserted in a vertical descending borehole and sealed by a large packer. Another particularity of the experimental setup is the possibility of heating the experimental section up to 80°C. Finally, the equipment was built in such a way that such that it will be retrievable from the borehole after several years of experiment, in order to perform further analyses on the reacting materials (core and steel samples).

A circulation loop links the experimental interval to the sampling, measuring various parameters (pH, Eh, electrical conductivity, dissolved oxygen and hydrogen) and control equipment installed in a cabinet, in the gallery of the underground laboratory. At the surface, all flow lines coming from the intervals (injection and extraction of the internal and external intervals) are connected to the control unit. A magnetic drive gear pump is used as driving force for the circulation.

The objective of this contribution is to present this set up and the first results about the corrosion monitoring.

**References:**

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