Preface

The reinforced concrete is widely used in the construction of nuclear power plants, of nuclear facilities and structures for long-term storage and the disposal of radioactive waste. Indeed this kind of material is used for many purposes, including support, containment, and environmental protection for different types of facilities: *e.g*. surface structures, shallow subsurface vaults and deep underground repositories.

These structures are required to besafe and reliable in challenging and varying environments for periods of time that can potentially range up to several hundred years. During their operational life, these structures will in all likelihood be subjected to a number of environmental stresses or ageing factors that may adversely affect their performance and result in shortened service lives.

The detection and assessment of the magnitude as well as the rate of occurrence of any environmental factor-related degradation are key factors in maintaining the capability of these structures to meet their operational requirements. As the knowledge base for modern concretes, such as would be used in fuel cycle-related facilities, is relatively new (*i.e*. about, 100 years *versus* the required 200 to 500 or more years), additional inputs are required in several areas to ensure that these structures will continue to meet their design requirements throughout their operational life.

Within this context, the international Workshop entitled "NUCPERF 2006, Corrosion and Long Term Performance of Concrete in NPP and Waste Facilities" (EFC Event 284) was held at Cadarache (France), on 27–30 March 2006. Its purpose was to bring together scientists and engineers from various countries that are developing nuclear power generation and/or waste disposal programmes. A special focus has been made on the discussion on R&D progress with regard to concrete degradation and corrosion of steel reinforcements in order to reach a consensus on R&D needs to further develop cooperative programmes. The sessions of the workshop covered the following areas, from fundamental aspects to technically relevant industrial applications:

- **Present and Future Expectations** on regulations, design codes and R&D programmes;
- **Experimental Studies** mainly focused on corrosion of embedded steels and its mechanical consequences, reactive agents transport and chemical degradation of concrete;
- **Phenomenological Modelling** of the different mechanisms involved in reinforced concrete degradation (corrosion, transport, mechanics, etc.);
- **Service Life Models** focused on the assessment of reinforced concrete structures and life cycle analysis;
- **Feedback Experience** use of field experiences and archaeological artefacts for the phenomenological understanding and modelling;
- **Monitoring and Repair** on-site corrosion evaluation, repairing techniques performance…

The organisation and the success of this Workshop have been made possible thanks to CEA (Commissariat à l'Énergie Atomique) and EDF (Électricité de France) which co-organised this event. It was co-sponsored by EFC/WP4 (European Federation of Corrosion, Nuclear corrosion working party) and OECD/NEA (Nuclear Energy Agency) which the editors want to warmly thank for their active scientific and practical contributions. The editors would also like to thank the authors who

presented papers of outstanding scientific content and who responded enthusiastically to the discussions and questions raised during the Workshop, the programme committee, who had to make the tricky selection of the presented papers, and finally the reviewers of the papers presented in this special issue.

This Workshop was a forum to exchange state-of-the-art knowledge on corrosion and long-term performance of concrete in nuclear power plants and waste facilities. The editors hope that the scientific results gathered in these proceedings will be useful to scientists and engineers in the field of reinforced concrete materials for nuclear applications.

Valérie L'Hostis, François Foct and Damien Féron
Editors of this Special Issue

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