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Foreword

An energy bill was passed in France in July 2005, which defined the French energy policy for the next decades. The Parliament decided to foster the production of the energies with low emission of greenhouse gases and contributing to the reduction of the French dependence on foreign resources. Therefore, they support the development of nuclear and renewable energies by priority. The expected renewal of the existing nuclear plants starting in 2020, the sustainable management of ultimate nuclear wastes, and, if needed, the extension of the nuclear production capacity are key issues. Indeed, this policy should take also into account several important points: the likely development of (hybrid or full) electrical motorisation of the vehicles, the development of renewable energies (biofuels, more generally biomass conversion, and hydraulic, wind and solar electrical production), the use of the hydrogen vector obtained from water decomposition by electrolysis, etc., in order to provide an answer for the world demand for sustainable and clean energy supply.

Regarding nuclear energy, the need for innovative technologies implies comprehensive research studies of the phenomena dealing with actinides, especially with a view to:

- optimising the use of uranium and plutonium by recycling them in appropriate reactors;
- mitigating the impact and the size of interim storage and deep repositories by partitioning specific elements from spent fuel and waste;
- increasing the safety and the lifetime of new plants by creating new materials for the structures;
- complying with the requirements of GEN IV plants for fuels and waste by conceiving new fuels (high temperature, recycling of actinides) and new conditionings.

Significant progresses using a pluridisciplinary approach in basic research dealing with solids, liquids and interfaces chemistry and physics are required for reaching such objectives.

This thematic issue, entitled *Nuclear energy and radiochemistry*, highlights the research trends in five specific fields concerned with actinides:

- coordination chemistry of actinides and lanthanides;
- physicochemical study of actinides and lanthanides in solution;
- selective extracting agents and actinide−lanthanide separation;
- radioelements in the environment;
- actinides and lanthanides in unconventional media.

The present review demonstrates the high scientific level of the European and Russian scientific communities in these topics and the excellence of their research centres.

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