Outcome of the Working Group 1
Cement

4th Exchange Forum, Prague
29 – 30 October 2013

Rapporteurs:
Lawrence Johnson
Bernhard Kienzler
Initiating group is asking the IGD-TP to form a Working Group on this topic

- Verify that there is a benefit from such a joint project
- Bring together interested organizations to form a consortium:
  - Prepare for a project proposal
  - Recommend support of such a project
  - Submit request in response to call
Background

- At the IGD-TP Exchange Forum in Nov. 2012, a presentation was made regarding interest in a TSWG on cement (CEBAMA).
- The Executive Group of the IGD-TP in Feb. 2013 requested that the WMOs be surveyed to determine their needs regarding studies on cement materials interactions in support of long-term safety.
- Responses were obtained from ANDRA, NDA, SKB, POSIVA, SURAO, NAGRA, ONDRAF/NIRAS.
- A further discussion of CEBAMA took place at the Ghent Cement-Waste Workshop. There was broad interest from specialists in initiating a project. From the WMO’s perspective, there was no consensus on how to move forward.
- WMO representatives had a further discussion on 11 Sept. 2013 on the question of areas of common interest.
Presentations during Working Group Cement

- Introduction and discussion of commonalities & differences among WMO concepts (L. Johnson, Nagra)
- Results and future plan of RWMC’s R&D regarding cement-bentonite interaction (H. Owada, RWMC)
  - Interface cement-bentonite interaction, including in-situ measurement
- How do we treat cement in performance assessment? (F. Neall, Galson Sci.)
  - Emphasis on transport properties of degraded cement
- Thermodynamics and modelling (L. Duro, Amphos21)
  - View data available, kinetics, behaviour of system, volume of phases
- RN retention and redox conditions (M. Altmaier, KIT)
- Cementitious materials: state of the art (X. Bourbon, Andra)
  - Consideration of “industrial reality” with respect to
    - Influence of chemical evolution on hydromechanical properties
    - emphasis on low pH / low hydration heat cements
  - chemical evolutions and physical properties
  - clay chemistry „behind the interface“, cement/clay bonding (seals)

- Immobilisation of Radionuclides by a Cementitious Backfill (D. Read, Uni Loughborough)
  - Feasibility of chemical containment by long-term diffusion & advection experiments. Interaction of RN with organic ligands (cellulose degradation or superplasticisers).

- Status of the proposed CEBAMA project (B. Kienzler, KIT)
## Discussion Basis for Cebama

<table>
<thead>
<tr>
<th>WP No</th>
<th>WP title</th>
<th>Lead Org.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP 1</td>
<td>Transport properties</td>
<td>PSI (?)</td>
</tr>
<tr>
<td>WP 2</td>
<td>Organics - cement interaction</td>
<td>?</td>
</tr>
<tr>
<td>WP 3</td>
<td>Radionuclide retention</td>
<td>KIT</td>
</tr>
<tr>
<td>WP 4</td>
<td>Steel corrosion</td>
<td>?</td>
</tr>
<tr>
<td>WP 5</td>
<td>Thermodynamics and modeling</td>
<td>Amphos21</td>
</tr>
<tr>
<td>WP 6</td>
<td>Knowledge, reporting and training</td>
<td>?</td>
</tr>
<tr>
<td>WP 7</td>
<td>Project management</td>
<td>KIT</td>
</tr>
</tbody>
</table>

Duration: 3 yrs. of experimental time
Why topics were removed

- Strengthen the project by focus on certain issues.
- Sharp focus allows more concentrated work by multiple groups, thus strengthening integration within the project.
- Cement-organics-radionuclide interactions is a major topic in itself.
- Steel corrosion in cement widely studied by WMOs
  - Input will be provided for the project based on published information. (CAST project; WMO publication in preparation)
New Structure of Cebama

<table>
<thead>
<tr>
<th>WP No</th>
<th>WP title</th>
<th>Lead Org.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP 1</td>
<td>Interactions influencing transport properties</td>
<td>PSI (?)</td>
</tr>
<tr>
<td>WP 2</td>
<td>Radionuclide retention</td>
<td>KIT</td>
</tr>
<tr>
<td>WP 3</td>
<td>Thermodynamics and modeling</td>
<td>Amphos21</td>
</tr>
<tr>
<td>WP 4</td>
<td>Knowledge, reporting and training</td>
<td>?</td>
</tr>
<tr>
<td>WP 4</td>
<td>Project management</td>
<td>KIT</td>
</tr>
</tbody>
</table>

New TSWG: Review of Organics - radionuclides - cement interaction
- Provide State of the Art Report within the project
- Provide Report on Implication of Steel Corrosion on cement and radionuclide behaviour
Possible structure of the project

WP1. Transport properties
WP2. Radionuclide retention
WP3. Thermodynamics & Modelling
WP4. Dissemination, Reporting and training
WP5. Management

TSWG Organics

WP0. EUG
Next Steps

- Circulate the WMO’s responses to the questionnaire on cement issues to Bernhard.Kienzler@kit.edu
- WMOs formulate questions to be answered in the project
- Potential partners review the information and provide input where to contribute.
- Planning meeting in March 2014 at KIT defining priorities (Representatives from WMOs an R&D Orgs.)
- TSWG meeting on Organics - radionuclides - cement interaction (Representatives from WMOs an R&D Orgs.) (spring 2014)
Summary of the Cement WG

- Discussions within TSWG and with WMOs on cement issues over the last year resulted in a mature project basis
- Cement working group agreed upon the basis for a potential project covering
  - Interactions influencing transport properties
  - Radionuclide retention
  - Thermodynamics and modeling
- WMOs will formulate questions to be answered in the project
- Potential partners review the information and provide input where to contribute.
- Planning meeting in March 2014 at KIT defining priorities (Representatives from WMOs an R&D Orgs.)
- TSWG meeting on Organics - radionuclides - cement interaction (Representatives from WMOs an R&D Orgs.) (spring 2014)