**Integration Group for the Safety Case (IGSC) Symposium 2024**  
*MOVING TOWARDS THE CONSTRUCTION OF A SAFE DGR – GETTING REAL*

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| **Abstract Number: 68** | **Session 7.1.3** |
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| **Abstract Title:**  **EURAD-GAS: Overview of knowledge gained on gas transport in clayey materials** | |
| **Abstract (300-500 words):**  The generation of gas is generally unavoidable in underground repositories for radioactive waste. The processes, produced quantities and the generation rates depend on the waste type, repository concept and rock but it is always necessary to evaluate how gas will accumulate in, be transported through, and be released from a geological disposal system. Gas production is generally slow but so is the removal of the gas through engineered barrier components and a host rock that are chosen for their tightness. Hence, possible perturbations of the system induced by gas pressurization have to be considered. The largest fraction of the gas by far will be hydrogen produced by the anaerobic corrosion of metals present in the waste and in the engineered barriers. Radiolysis and chemical degradation of waste (e.g. organics) and repository materials will also produce gas. Gas production, consumption or conversion by microbes cannot always be ruled out. While almost all of the gas will be inactive, the possibility that it could carry along small amounts of radioactive gas also requires consideration and underpinning knowledge. It comes thus as no surprise that gas production and transport appear in several medium and high priority topics for collaborative R&D in the roadmap of EURAD, the first European Joint Programme on Radioactive Waste Management (2019-2024). In particular, improving the understanding of gas transport and of the perturbations that it can induce in the components of the engineered barrier and the host rock has been marked as high priority.  Owing to their favourable properties for the confinement of contaminants, clays are considered as potential host rocks for geological disposal in several European countries. Many concepts for the engineered barrier systems also include clay-based components. Consequently, EURAD includes a work package devoted to the mechanistic understanding of gas transport in clayey materials (WP GAS). It aims to:   * improve the understanding of gas transport processes in natural and engineered clayey materials, their couplings with the mechanical behaviour and their impact on the properties of these materials; * evaluate the gas transport regimes that can be active at the scale of a geological disposal system and their potential impact on barrier integrity.   This communication explains how EURAD-GAS was extending the experimental database and was assembling a knowledge basis that can support a wide range of national programmes. This was possible because the results of previous efforts, e.g. during the FORGE EC project, suggested that while the conditions for the transition from one transport regime (diffusion, two-phase flow, pathway dilation and fracturing) to another are material-specific, the mechanisms at play in different clays are similar.  It is also shown how EURAD-GAS explored methods and models to transfer knowledge gained from laboratory and in situ experiments to configurations and conditions that are representative of typical repository designs for addressing the end-users questions:   * How much water soluble and volatile radionuclides could be displaced or transported by gas throughout a repository? * To what extent could the perturbations of the barriers induced by gas affect repository performance? | |