

## **Geochemical characterization of black shales and flowback in lab and field and subsequent modelling studies**

FRANZISKA D.H. WILKE<sup>1\*</sup>, ANDREA VIETH-HILLEBRAND<sup>1</sup>, MICHAEL KÜHN<sup>1,2</sup>, MONIKA KONIECZYŃSKA<sup>3</sup>

<sup>1</sup>GFZ German Research Center for Geosciences, Potsdam, Germany; (\*correspondance: fwilke@gfz-potsdam.de, vieth@gfz-potsdam.de, mkuehn@gfz-potsdam.de)

<sup>2</sup>University of Potsdam, Institute for Earth and Environmental Sciences, Potsdam, Germany

<sup>3</sup>PGI Polish Geological Institute-National Research Institute, Warszawa, Poland (mkon@pgi.gov.pl)

The European unconventional gas production is still a matter of political as well as public debate and concern. European countries such as Poland, Denmark and the UK ran pilot drill sites already whereas Germany plan to run pilot drill sites in black shales, from which unconventional gas recovery could be economically feasible. New laws and regulations covering unconventional gas production have not put an end to public complaints regarding quantities and quality of flowback fluid after hydraulic fracturing.

Using well characterized German Posidonia shale and Danish Alum shale, we initially performed short-term and long-term experiments under elevated temperatures and ambient pressure and elevated pressures, respectively. The types of stimulation fluids used span from pure water to one that was prepared similarly to fluids used during industrial stimulation. Later on we sampled flowback taken after hydraulic stimulation of one horizontal well in the Pomerian region of Poland. All fluids were analysed for inorganic as well as organic chemical composition. Some experimental derived flowback were also subject to radioactivity measurements. In addition, geochemical simulations of fluid-rock interactions were performed. First, the data basis was adapted and amended from the literature. Second, the system was parameterized with field data provided. Third, data evaluation was performed with respect to our experimental findings.

Within our presentation we will give an overview about precipitates formed during our experiments, about inorganic and organic compounds found in the experimentally as well as in the industrially derived flowback and about the results of the geochemical modelling.