The Role of Geomechanics in Unconventional Shale Gas Reservoir Performance. (Palaeozoic Peri-Baltic Syneclise, Poland)

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Geomechanics for unconventional resources differs from conventional reservoirs mainly due to inelastic matrix behavior, stress sensitivity, rock anisotropy, rock rheology and low matrix permeability. Effective horizontal drilling and hydraulic fracturing technologies are required to obtain and maintain high performance. Success of these techniques strongly depends on the geomechanical investigations of shales. Shale rocks may exhibit complex elasto-viscoplastic deformation mechanisms depending on the rate of deformation and the amount of clay minerals. An inelastic behavior of shales draws increasing attention of investigators [1], due to its role in stress relaxation between fracturing phases. Non-standard rock mechanics laboratory experiments are being applied in order to obtain the mechanical properties of shales that have not been previously studied in Poland. Novel laboratory investigations were carried out to assess the creep parameters and to determine time-dependent viscoplastic deformation of shale samples, which can provide a limiting factor to tectonic stresses and control stress change caused by hydraulic fracturing. We developed and improved measurements aiming at the assessment of shale structure damage developing in course of deformation and assess anisotropy due to a critical number of microcracks and their size, that leads to the final rock damage controlled by the local stress.

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[1] Ch. Chang M. D. Zoback. (2009). *Journal of Petroleum Science and Engineering* **69**: 239–246.