

20.14 **A comparative overview of the solvent swelling studies of oil shales**

Jelena Hruljova, Natalja Savest, [Vahur Oja](#)

Department of Chemical Engineering Tallinn University of Technology, Tallinn, Estonia

Volumetric expansion in solvents (swelling) is a widely used technique to determine solubility parameters of macromolecular substances, to characterize solvent-macromolecule interactions or to calculate crosslink density and number average molecular weight per cross-link of the macromolecular structure. There are abundant data on solvent swelling of different polymers and coals in literature. However, many coal related studies have shown that although being a valuable tool, its regular solution theory based application suffers weaknesses when applied on systems containing heteroatoms, especially with hydrogen bonds forming capabilities.

Oil shale is a complex heterogeneous material with an organic part consisting primarily of kerogen that can be described as a highly cross-linked macromolecular structure. It can be shown that there are oil shale formations that follow reasonably well regular solution theory (Green River oil shale for example) and also oil shale formations for which application of the theory can be considered only a very crude approximation (Kukersite oil shale for example). These latter oil shale types show a tendency to have swelling maximums in polar solvents and increase in solvent uptake with increasing Gutmann's donor number of solvents. As different authors have published several datasets on oil shale and/or its kerogen solvent swelling, the objective of this study is to evaluate and compare equilibrium swelling information available for different types of oil shale. For comparative purposes the collected literature data and data obtained from our laboratory were recalculated based on dry organic matter content.