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SOLVENT SWELLING OF ESTONIAN OIL SHALES: LOW TEMPERATURE THERMOCHEMICAL CONVERSION CAUSED CHANGES IN SWELLING

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Oil shale organic matter is known to a large extent consist of kerogen, a macromolecular network, which is largely insoluble in solvents and that swells when immersed in certain organic solvent. This organic macromolecular network structure of the kerogen must somehow be broken down in order to release lower molecular weight compounds (oil material) from this matrix. Because of this reason knowledge of the macromolecular structure of oil shale kerogen and of the changes caused by different types of treatments of the network (heat-treatment, solvent penetration) can be useful information to guide upgrading process development.

Among many available techniques for characterizing macromolecules, volumetric solvent swelling is one of the simplest methods, which has had some success when applied to fossil fuels such as coals and also oil shales. Concerning Estonian oil shales, only one dataset on kukersite swelling in watery trichloromethanol could be found and no other studies on organic solvents have been conducted. No data were also found on the use of solvent swelling to investigate changes in oil shale organic matter structures up to temperatures of oil shale thermobitumen formation (up to 350–400 ^{o}C) – before the onset of major pyrolytic processes.

The information obtained from solvent swelling can be used to characterize cross-linked structures, to determine solubility parameters (square root of cohesive energy density), molecular weights between cross-links or cross-link densities of fossil fuels with cross-linked macromolecular structures.

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