

ONE-STEP DIRECT CATALYTIC SEWAGE SLUDGE LIQUEFACTION OVER A SULFIDED METAL CATALYST

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Sewage sludge is a mud-like residue from the wastewater treatment. It contains organic compounds which could be valorised to fuels and other valuable compounds. Sewage sludge liquefaction was performed, with the aim of exploring the direct one-step catalytic deoxygenation-hydrocracking of the organic feedstock to produce synthetic crude and other compounds such as hydrogen, ethylene or propylene. The catalyst was a commercial metal sulfided hydrocracking NiW/SiO₂-Al₂O₃ material. The reaction was performed with 20 g of dried sewage sludge, 50 g of tetralin and 2 g of catalyst in a batch reactor at 420 °C for 1 h (P_{H₂}=5 MPa at room temperature). The feedstock and products were analysed (GC/FID-TCD, elemental H, C, N, S% analysis, TGA (O₂ and N₂) and ATR-FTIR). For the gases, the main products were ethane, methane, CO₂ and CO. Liquid products in the boiling range of 50-390 °C were obtained. Tetralin was not a relatively inert solvent as occurred, for example, for the direct coal liquefaction reaction implying a lower yield to liquids compared to the standard direct coal liquefaction [1].

[1] Frątczak J, Hidalgo Herrador JM, Lederer J, et al. (2018) Direct primary brown coal liquefaction via non-catalytic and catalytic co-processing with model, waste and petroleum-derived hydrogen donors. *Fuel* 234:364-370. <https://doi.org/10.1016/j.fuel.2018.06.131>

Acknowledgements:

The abstract is a result of the project which was carried out within the financial support of the Ministry of Industry and Trade of the Czech Republic with institutional support for long-term conceptual development of research organisation. The result was achieved using the infrastructure included in the project Efficient Use of Energy Resources Using Catalytic Processes (LM2018119) which has been financially supported by MEYS within the targeted support of large infrastructures.