Solvothermal conversion of lignosulfonate assisted by ni catalyst - Investigation of the role of ethanol and ethylene glycol as solvents - DTU Orbit (19/08/2019)

**Solvothermal conversion of lignosulfonate assisted by ni catalyst - Investigation of the role of ethanol and ethylene glycol as solvents**

In this study, reductive solvolysis of lignosulfonate using Ni-based catalysts in ethylene glycol (EG) and ethanol (EtOH) at 250°C was investigated. The liquefied fractions, regarded as oil, were carefully analyzed using size-exclusion chromatography (SEC) and gas chromatography–mass spectrometry with flame ionization detection (GC-MS-FID). The oil yields from catalytic conversion in EtOH and EG were similar, being 31 and 32 wt.%, respectively. The oil fractions from depolymerization in EtOH had lower molecular weight compared to the oil products in EG, indicating a higher degree of degradation of liquefied products in EtOH. On the other hand, EG showed superior activity in inhibiting condensation reactions; 16 and 46 wt.% tetrahydrofuran (THF) soluble and THF insoluble solid fractions were obtained from conversion in EtOH, while those numbers in EG were 45 and 23 wt.%, respectively. The Ni-based catalyst was introduced to provide active sites for hydrogenation of lignosulfonate fragments released into the solvent. The presence of NiS in the spent catalyst, formed from reaction between Ni and sulfur in the lignosulfonate, was confirmed. The sulfur content in the oil obtained in EtOH was 0.38 wt.%, which in comparison to lignosulfonate with 3.1 wt.% sulfur, indicated a high level of desulfurization.

**General information**

Publication status: Published
Organisations: Department of Chemical and Biochemical Engineering, CHEC Research Centre, Haldor Topsoe AS, Borregaard AS
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Number of pages: 18
Publication date: 2018
Peer-reviewed: Yes

**Publication information**

Journal: Catalysts
Volume: 8
Issue number: 11
Article number: 502
ISSN (Print): 2073-4344
Ratings:
BFI (2018): BFI-level 1
Scopus rating (2018): CiteScore 3.58 SJR 0.853 SNIP 0.912
Web of Science (2018): Impact factor 3.444
Web of Science (2018): Indexed yes
Original language: English
Keywords: Catalysis, Depolymerization, Lignosulfonate, Nickel, Solvothermal, Sulfur
Electronic versions:
catalysts_08_00502_v2.pdf
DOIs:
10.3390/catal8110502

**Bibliographical note**

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Source: Scopus
Source-ID: 85056356897
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review