Selective phenol recovery via simultaneous hydrogenation/dealkylation of isopropyl- and isopropenyl-phenols employing an H_2 generator combined with tandem micro-reactor GC/MS

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Abstract:

The pyrolysis of bisphenol A (BPA), an essential process ingredient used in industry and many everyday life products, helps produce low-industrial-demand chemicals such as isopropenyl- and isopropyl-phenols (IPP and iPrP). In this study, tandem micro-reactor gas chromatography/mass spectrometry combined with an H_2 generator (H_2-TR-GC/MS) was employed for the first time to investigate the selective recovery of phenol via simultaneous hydrogenation/dealkylation of IPP and iPrP. After investigating the iPrP dealkylation performances of several zeolites, we obtained full iPrP conversion with over 99% phenol selectivity using the Y-zeolite at 350ºC. In contrast, when applied to IPP, the zeolite acid centres caused IPP polymerisation and subsequent IPP-polymer cracking, resulting in many byproducts and reduced phenol selectivity. This challenge was overcome by the addition of 0.3 wt% Ni on the Y-zeolite (0.3Ni/Y), which enabled the hydrogenation of IPP into iPrP and subsequent dealkylation into phenol (full IPP conversion with 92% phenol selectivity). Moreover, the catalyst deactivation and product distribution over repetitive catalytic use were successfully monitored using the H2-TR-GC/MS system. We believe that the findings presented herein could allow the recovery of phenol-rich products from polymeric waste with BPA macro skeleton.

* Excerpted from online journal website (Click the title)

Frontier Labs Products used:

Tandem micro Reactor RX-3050TR, UA$^+$-1