HYDRODEOXYGENATION OF PINE PYROLYSIS OIL WITH ZIRCONIA-SUPPORTED NOBLE-METAL CATALYSTS

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The need for renewable alternatives for fossil fuels has encouraged research on renewable energy-carriers. Pyrolysis oil, the product of fast-pyrolysis of lignocellulosic biomass, is considered a very attractive alternative. A possible outlet for pyrolysis oil is to co-feed the material to a classical refinery cracker or hydrotreating unit. However, the pyrolysis oil in pure form is immiscible with conventional refinery feedstocks. A possible way to improve miscibility is a reduction of the high oxygen content (up to 50%) of the pyrolysis oil.

Hydrodeoxygenation (HDO) with refinery hydrodesulfurization catalysts is known to lower the oxygen content of pyrolysis oil to less than 5%[1]. However, sulfur is required for good catalyst performance and needs to be added to the feed. Noble-metal based catalyst have been reported to be active hydrogenation catalysts without any need of sulfur addition which makes them good candidates for further development.

We here report the synthesis and performance of noble metals (Rh, Pt, Pd) on zirconia as catalysts for the HDO of pyrolysis oil. ZrO_2 was chosen as the support as it is known to withstand the harsh conditions required for HDO (350-400^{o}C). The ZrO_2-supported catalysts were tested on a model compound (guaiacol) and were shown to be active and in some cases also selective for HDO [2]. The catalysts were also tested for pyrolysis oil and all showed good deoxygenation activities (Figure 1). Analysis of the resulting oils will be reported and it will be shown that the amount of several oxygenates like acids and aldehydes are reduced significantly upon reaction.

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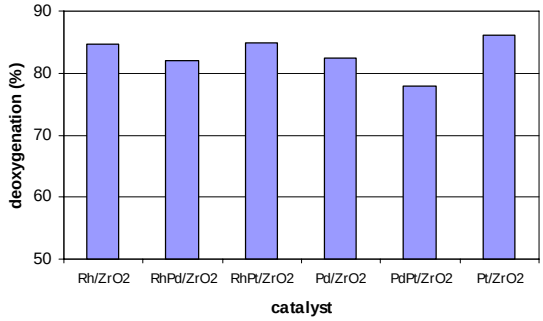

Figure 1 Deoxygenation of pyrolysis oil using noble metal-zirconia catalyst (200 bar, 350^{o}C)

[1] D. C. Elliott, G. G. Neuenschwander, in *Developments in Thermochemical Biomass Conversion, Vol. 1* (Eds.: A. V. Bridgwater, D. G. B. Boocock), Blackie Academic & Professional, London, **1996**, pp. 611.

[2] A. Gutierrez, R. K. Kaila, M. L. Honkela, R. Slioor, A. O. I. Krause, *submitted to Catalysis Today* **2008**.