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Heterogeneous Hydrogenations in Continuous Flow

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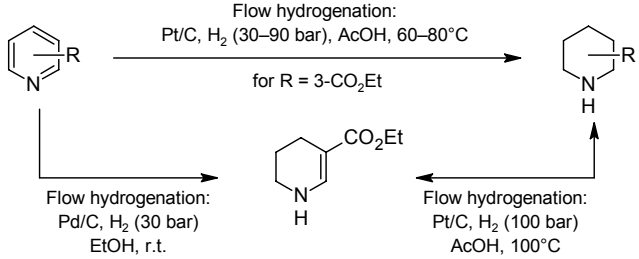
Catalytic heterogeneous hydrogenation processes arguably belong to the most valuable synthetic transformations known. Current batch reactor technology is not only time consuming and difficult to set up but also catalyst addition and filtration is hazardous. Because of the aromatic character of many substrates, hydrogenation often requires the use of significant hydrogen pressures in combination with elevated temperatures and extended reaction times.

In this context, continuous flow hydrogenation technology presents an attractive alternative to batch processing and the recent introduction of the H-Cube™ – a continuous flow hydrogenation device incorporating *in-situ* hydrogen generation and pre-packed catalyst cartridges – has provided a safe and reliable method for performing hydrogenation reactions [1, 2].

In this poster we investigate the hydrogenations of olefins and heterocyclic aromatic rings. In general, the hydrogenations proceeded smoothly independent from the choice of the supported precious metal catalyst (Pd/C, Pt/C or Rh/C). Using 30–80 bar of hydrogen pressure at 60–80 °C full conversion was typically achieved in all cases at a flow rate of 0.5 mL min^{-1} providing the corresponding piperidines in high yields. For disubstituted pyridines variations in stereoselectivity were observed depending on both the metal catalyst and on the temperature/pressure in the reaction. For ethyl nicotinate the selectivity between partial and full hydrogenation could be tuned depending on hydrogen pressure and the choice of the supported metal catalyst. Changing the hydrogen source from H_2O to D_2O allowed the preparation of deuterated derivatives [3].



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