Combinational and High-Throughput Development and Optimization of Heterogeneous Catalysts and Materials

Search for selective and noble metal free liquid phase hydrogenation catalysts

The vast majority of hydrogenation catalysts consists of noble metal containing materials. These materials are not only expensive but also rare. Therefore it is desirable to find new noble metal free catalysts. With the Chemspeed Accelerator SLT 106 it is possible to screen potential liquid phase catalysts fast in a parallel mode.

For the selective hydrogenation of citral to camphor the medium pressure blocks can be used. Figure 1 shows the reaction scheme and figure 2 the picture of one reactor block with 16 reactors. The reaction is performed at a temperature of 90 °C and a H₂ pressure of 80 bars. The Chemspeed robot performs not only the reaction but also takes samples for analyses by GC.

Screening of different potential catalysts for the Heck-coupling

Cross couplings are an important tool to synthesize new C-C bonds, because they yield a wide range of functional groups. In the range of this cross couplings the Heck-coupling is one of the most important reactions for industrial application.

The problem of this coupling is the expensive test of catalysts, so it is interesting to find new catalysts, which have a lower or no Pd content. The combinatorial chemistry shows to be an efficient way to find new catalysts.

Development of new nano-scaled mixed metal sulfide catalysts with the help of combinatorial and high-throughput methods

The development of a high-throughput synthesis method is a key step in the development of new heterogeneous catalysts based on nano-sized mixed metal sulfides when applying combinatorial methods.

The use of the Chemspeed synthesis robot provides a potential high-throughput approach for the preparation of these mixed metal sulfides. The synthesis of the nanoparticles can be carried out in a microemulsion (ME). The four needle head unit is used for a standardised preparation of the ME in the reaction vessel (16fold medium pressure block with glass inlets). The addition of the sulfide source to the ME is carried out by the solid dosing unit (SDU) with customised extenders. The metal precursor is added prior to the ME. This experimental procedure allows the parallel synthesis of 48 metal sulfides (use of three medium pressure blocks) under various reaction conditions.

References:

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