Germanium catalysts for hydrosilylations & siloxane couplings

Our inventors present new, storable and highly efficient germanium (II) catalysts for use in hydrosilylations and siloxane coupling reactions. The catalysts can be prepared by a relatively simple route from commercially available educts and purification of the catalyst is simple.

IP RIGHTS
European Patent Application filed
2021

Cost-effective, easy-to-prepare catalyst

The inventive catalysts can be used for the production of a broad range of industrially relevant silicones, e.g. for silicon elastomers and dispersants. Germanium is considered non-toxic and harmless which makes the inventive catalysts ideals for the production of goods coming into contact with skin or food items.

01 Highly efficient & selective cationic germanium catalysts. Precious metal-free (no discoloration issues)
02 Ideal for hydrosilylations and siloxane couplings, oxygen-free reaction settings possible
03 One-pot, cost-effective, high-yield preparation of catalyst
04 Easy separation of volatile by-products
05 Catalyst is a storable, colorless solid that can be used directly for target reactions
06 International PCT patent application planned for 2023

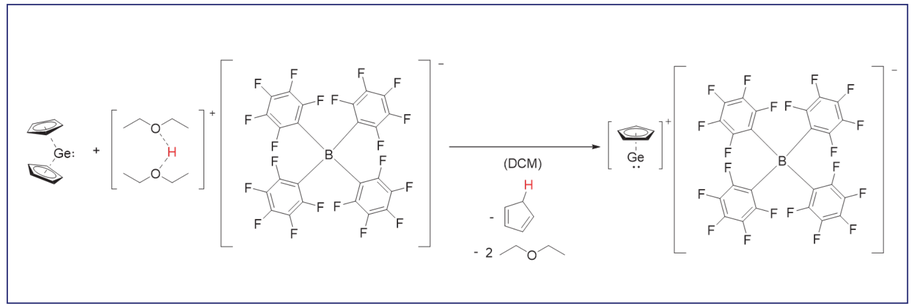


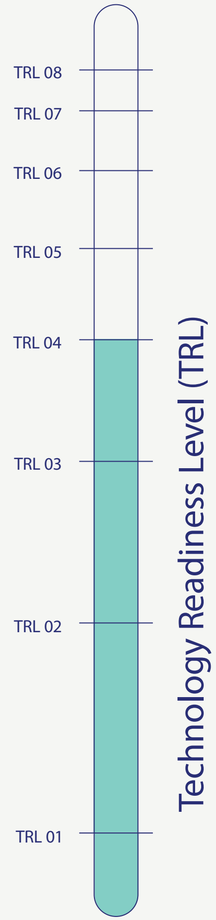
Figure 1: Exemplary reaction scheme for the synthesis of the inventive cationic Germanium (II) catalyst: germanocen reacts with acidic boranates to form the catalyst.

CHALLENGE

Hydrosilylations and siloxane coupling reactions are generally catalysed using precious metal catalysts. Apart from the cost issue regarding precious metals, platinum-based catalysts especially are also known to cause discoloration of silicon products after a certain amount of time. Germanium catalysts have been known scientifically, but the ones used so far are based on demanding and expensive synthesis routes and cannot be used in oxygen-free conditions.

INNOVATION

The new Germanium (II) catalysts are produced in a simple one-pot synthesis from germanocen (CP_2Ge) and acidic boranates with high yields (Fig. 1). The inventors showed that storing the catalyst unprotected for three weeks in an uncovered vessel open to room air caused no detectable degradation of the catalyst. Upscaling of the catalyst production is assumed to be uncomplicated, since no special reaction equipment or plant technology is needed. Purification of the catalyst from the reaction medium can be done easily and cost-efficiently by evaporating the volatile by-products.



01 Basic principles observed · 02 Technology concept formulated · 03 Experimental proof of concept · 04 Technology validated in lab · 05 Technology validated in relevant environment · 06 Technology demonstrated in relevant environment · 07 System prototype demonstration in operational environment · 08 System complete and qualified

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Bayerische Patentallianz GmbH
Rebecca Kohler
rkohler@baypat.de
+49 89 5480 117-33
Prinzregentenstr. 52
80538 München