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ENERGY & MATERIALS

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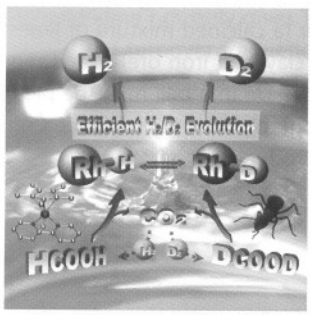
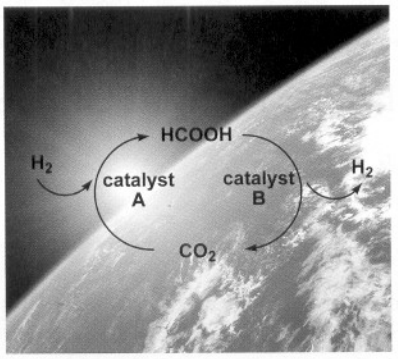
COVER PICTURE



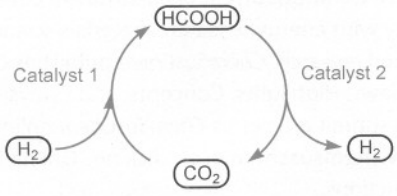
The cover picture shows a scheme for the efficient rhodium-catalyzed evolution of H_2 or D_2 from formic acid (HCOOH), a substance produced naturally by ants. The use of hydrogen as an environmentally benign secondary energy resource has attracted much attention, however, high-density storage and safe transportation of gaseous hydrogen remain problematic. An approach that can contribute also to cut carbon dioxide emissions is the use of CO_2 as hydrogen carrier to produce formic acid, a water-soluble liquid which is easy to store and carry. In their Full Paper on page 827 ff., S. Fukuzumi et al. describe how HCOOH is efficiently and selectively decomposed to produce H_2 and CO_2 in 1:1 ratio without the formation of CO in aqueous solution at 298 K catalyzed by the water-soluble rhodium aqua complex $[Rh^{III}(Cp^*)(bpy)(H_2O)]SO_4$. H_2 evolution occurs by formation of the hydride complex (Rh–H), which undergoes efficient H/D exchange with deuteron in D_2O to form the deuteride complex (Rh–D) in competition with the reaction with deuteron to yield D_2 and HD.

NEWS

HIGHLIGHTS

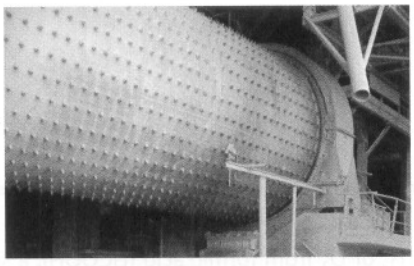


Fuelling the economy: In the search for sustainable and renewable energy systems, the hydrogen economy could be an alternative if several requirements can be fulfilled in the future. One major challenge is still the search for appropriate hydrogen-storage systems. The potential application of carbon dioxide as a hydrogen carrier is discussed in this Highlight.



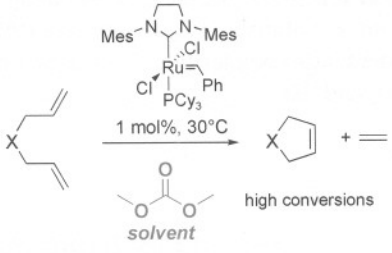
A boost for fuel cells: Recent results suggest that formic acid is a convenient hydrogen-storage material: its decomposition yields CO-free hydrogen while the co-produced carbon dioxide can be hydrogenated back to formic acid. The hydrogen generated in this way is suitable for fuel cell applications.

CONCEPTS



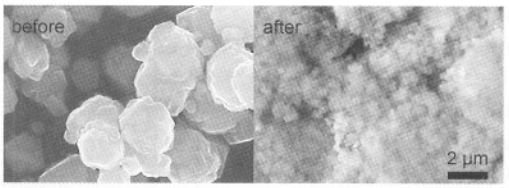
Greener building blocks: The addition of glycerol, a by-product of biodiesel manufacturing, to cement eases its grinding and handling while considerably enhancing the strength of the resulting concrete. For instance, less energy is needed to grind the so-called clinker (a calcined mixture of limestone, sand, clay, and iron ore) to the required particle size in a ball mill (see picture: photograph courtesy of Grace Construction Products).

COMMUNICATIONS

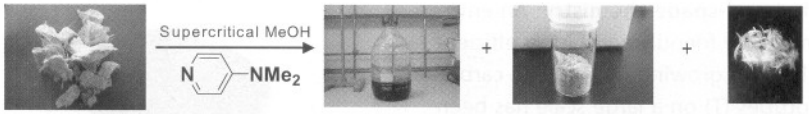


Ru 'n' DMC: A series of ruthenium-catalyzed olefin metathesis transformations were performed in the eco-friendly solvent dimethyl carbonate (DMC), and it was demonstrated that this solvent can be used as a substitute to dichloromethane or aromatic solvents. The ethenolysis of methyl oleate using the first-generation Hoveyda catalyst was also performed in DMC, where similar conversions were observed to those in toluene (82 vs 88%).

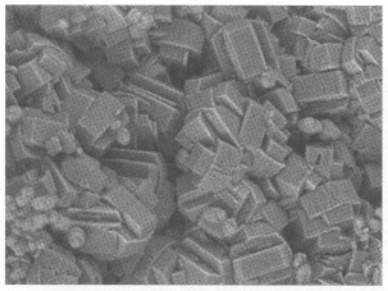
FULL PAPERS



Touching base: The selective conversion of glycerol to linear dimers was studied in a liquid-phase batch reaction at 260 °C under base catalysis. The reaction only marginally benefits from the use of Na/Cs-modified solid zeolites, as the crystallinity of the zeolite is lost within the first 2–6 h of reaction (see SEM images of CsX). The alkali cations are released into the liquid, and the reaction profile becomes similar to that of a homogeneously catalyzed reaction.



Break up, make up: Waste fiber-reinforced plastic (FRP), which is a difficult plastic in terms of monomer recycling, can be efficiently depolymerized in the presence of 4-(dimethylamino)pyridine (DMAP) in supercritical methanol. The present method also enables separation of the FRP into its monomeric material, linker units, and inorganic ingredients such as glass fiber and filler, all ready for recycling.



Foam lends support: The performance of a supported zeolite catalyst was studied in the methanol dehydration reaction to produce dimethyl ether. The smaller size of the HZSM-5 zeolite particles supported on β-SiC foam as compared to regular HZSM-5 particles leads to better diffusion of reactant molecules in and product molecules out of the catalyst, in turn leading to superior catalyst stability and better resistance to deactivation.

Supporting information at www.chemsuschem.org (see article for access details).

A video clip is available as Supporting Information at www.chemsuschem.org (see article for access details).

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INTERVIEW

BOOKS

