Hydrogen as energy carrier and its application in mobility

Arian Shoshi

Department of Chemical and Biological Engineering, Institute of Process Machinery and Systems Engineering, Friedrich-Alexander-Universität Erlangen-Nürnberg, Gjermani,
so@ipat.fau.de

Since hydrogen is not a primary energy, about 95 % of it is produced from fossil fuels. Fossil fuels are resources that will run out. In addition, their consumption in power plants, mobility and industry has a significant impact on climate change due to the emissions they release. The goal is in the near future hydrogen to be produced from renewable energy sources and to be used as an energy carrier that can be converted into electricity without a combustion process, but rather e.g. in fuel cells. The hydrogen produced is not always used immediately, therefore, must be stored for later consumption. Energy storage is an important area in the energy sector. There are several methods to store surplus energy. One of them is the storage of hydrogen produced by the electrolysis. There are different ways to store hydrogen, starting from physical storage: as compressed, liquefied gas or a combination of both and storage in materials: absorbers, hydride metals, organic compounds and others. This presentation will show how the released hydrogen from the liquid organic hydrogen carrier can be used in mobility and in industrial applications.

Liquid Organic Hydrogen Carries (LOHCs) are chemical compounds that store hydrogen by binding it chemically during the hydrogenation process in chemical reactors. In order hydrogenation process to take place, initially, heat at elevated temperatures and high-pressure is required. Since the process is an exothermic reaction on the occurrence of the reaction, heat must be removed from reactor. On the other hand, the release of hydrogen during the dehydrogenation process requires high thermal energy. This presentation demonstrate the form of how two devices offer the ability to utilize hydrogen more efficiently. By compressing hydrogen to very high-pressures up to 1000 bar as part of the dehydrogenation process, very high temperatures are achieved in hydrogen compressors. The heat generated during compression in most cases is removed as unused energy in the surrounding environment. In the framework of the current research, the possibility of transferring this heat to the organic hydrogen carrier has been analyzed in order to improve the thermal efficiency and volume efficiency of the compressor.