

Development of Advanced Composite Pressure Vessels for Hydrogen Storage

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Abstract

The shift from fossil fuels to fuel cells will increase the market demand on hydrogen. Efficient storage of hydrogen is crucial for the emerging hydrogen energy market. Storage is strongly connected to the performance and the safety of the car components. Currently, hydrogen is stored and transported in a compressed form to satisfy safety and weight regulations for high pressure gases and the traditional tanks that are used are made of stainless steel. Because of weight limitations these tanks are not suitable for automotive on-board applications. The weight of the tanks can however be considerably lowered, if composite materials can be used instead of stainless steel. At the same time the composite cylinders can offer high strength and safety. ADHERE is a project that aims at developing lightweight composite cylinders with improved mechanical and barriers properties for hydrogen using additive manufacturing (3D-printing). Furthermore, the motivation of the development of the cylinders are cost-competitiveness. It is also important that future consumed hydrogen is produced by renewable energy and therefore the new storage cylinders will also be studied in energy systems using wind turbines. The project influences future prospects of advanced materials research and innovation for creating more utilization, impact in the society and sustainability.

Keywords: advanced materials; energy materials; hydrogen; additive manufacturing

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