Transportation of green hydrogen in the Austrian gas grid

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Impact of gaseous hydrogen on the durability of pressurized polymer pipe systems

Hydrogen gas (H_2) holds promise as a pivotal solution to the global energy crisis. As shown in Fig. 1, it can be used for several intermittent, as well as final steps with regards to sector coupling. When used in fuel cells, it produces electricity with only water as a byproduct. It can store excess renewable energy, mitigating intermittent supply issues. Furthermore, hydrogen enables sectors like transportation and industry to transition away from fossil fuels. Its potential to enhance energy security, reduce pollution, and promote sustainable development underscores hydrogen's critical role in addressing the world's energy challenges.

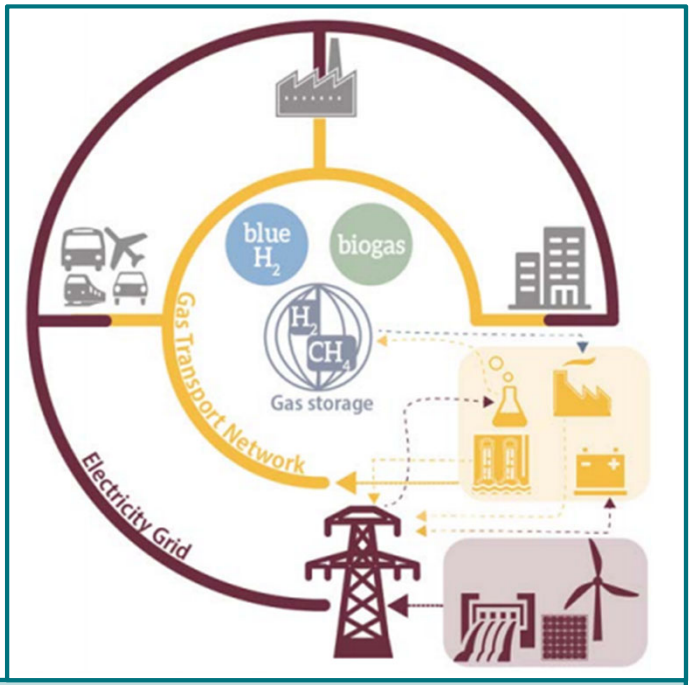
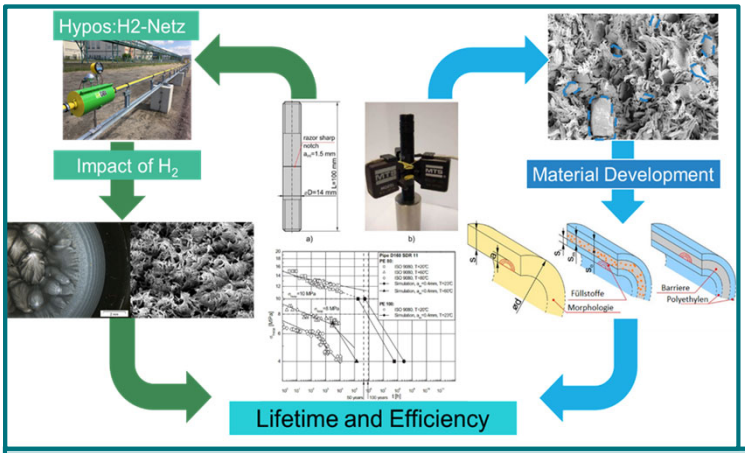


Fig.1

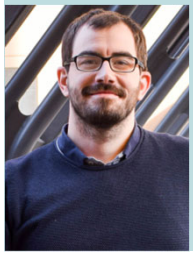
Sector coupling involves, among other, the production of gases such as H_2 and CH_4 from renewable electricity, storage and transport of energy as gases, supply of end-user with renewable gases and electricity produced from H_2 through fuel cells and from gas with thermal power plants (source European Parliament, ERPS).



One possibility to both store and transport H_2 is to use the existing natural gas grid in Austria. For pressure ratings below 10 bar, the most frequently used material is polyethylene (PE). However, for grid operators it is important to know, if the use of higher concentrations of H_2 could have a potential impact on the performance, or lifetime of these pipes and if there are ways to decrease the permeability of H_2 through PE to minimize energy losses (Fig. 2).

Fig. 2

PE pipes were exposed to pure H_2 gas at their maximum operating pressure in a former project of the DBI (H2-Netz) for more than 2 years. Our current aim is to determine any effects of H_2 on the polymer. In parallel, ways to decrease the permeability of H_2 through PE are investigated.



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RESEARCH FOCUS: Polymeric pipe grade materials, multi-layered systems and structures, fracture mechanics, mechanical impact and high-speed testing

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