Thermal Behavior of Polymers in Hydrogen Gas

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Hydrogen as a transportation fuel in fuel cell vehicles has found tremendous value in recent times with its potential as a source of clean energy with zero pollution. Therefore, it is critical that the effect of hydrogen on materials used in all aspects of the hydrogen economy such as production, storage, delivery, and conversion be well understood. In the hydrogen infrastructure, metals and several polymers are commonly used in components used in the hydrogen gas atmosphere. In the hydrogen infrastructure, these polymers may be exposed to a wide range of varying pressures (10-100 MPa) and temperatures (-70 °C to 85 °C) and often, as in fuel dispensing operations, can be subject to hydrogen pressure cycles in addition to temperature cycles [1]. In the present study, the characterization of some synthetic rubbers, nitrile butadiene rubber (NBR), ethylene propylene diene monomer (EPDM), and fluoroelastomer (FKM) are studied. They are analyzed in the raw and high-pressurized hydrogen state by studying with FT-IR and a Calvet calorimeter. The polymer was exposed to high-pressure hydrogen gas at 10 MPa and the tests were performed at temperatures ranging from -70 °C to 100 °C.

References:

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