

Flammability Limits of Hydrogen at Sub-Atmospheric Pressures and Reduced Oxygen Concentrations

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Prototypes aircraft are currently being built and tested that rely on hydrogen fuel cells to provide power for their electrical demands, and some even use hydrogen to power the entire aircraft. The problem with hydrogen is that it is extremely flammable and has never been used in this capacity before. Therefore, the flammability of hydrogen was tested from the pressure at sea level up to 40,000 feet in a 20 L vessel. The lower and upper flammability limits were found first and compared with previous data. Then, peak explosion pressure was found across all flammable hydrogen and oxygen concentrations. The oxygen concentration started from the concentration found in air and was reduced by adding nitrogen. These tests were performed up to the point where the limiting oxygen concentration was reached for each altitude. In general, as the altitude increased the limits of flammability for hydrogen and oxygen widened, and the peak explosion pressures decreased.