

The Effect of Water Vapor on the Blast Wave Pressures in the Explosions of Hydrogen-Air Mixtures

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Abstract

The effect of water vapor added to hydrogen-air mixtures on the blast wave pressures in the explosions of the mixtures was investigated in this study. 0.5m cubed (0.125m³) stainless steel frame covered with polyvinyl chloride film was filled with hydrogen-air mixtures. The blast wave pressures were measured both in the explosions of dry hydrogen-air mixtures and humid mixtures. Dry mixtures were made by purging the reactor with hydrogen-dry air mixtures enough to maintain the humidity lower than 20%. And humid mixtures were made by bubbling the mixtures in the water bottles to maintain the humidity higher than 80%. The concentrations of hydrogen (vol.%) are 20% - 40%. The mixtures were ignited by a red hot nichrome wire and the air blast pressures were measured using two sensors located at the distances of 1.16m and 2.27m. The blast wave history versus time was recorded using a digital waveform recorder. There are no significant differences seen with the difference of humidity at the concentrations of hydrogen around 30%. However, at the concentrations of hydrogen around 20% and 40%, the peak pressures and the impulses of the blast waves were reduced by 5 – 20 %.

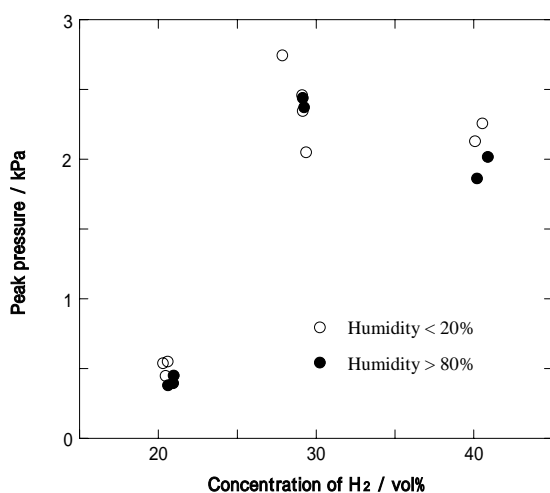


Fig. 1. Effect of Water Vapor on Peak Pressure

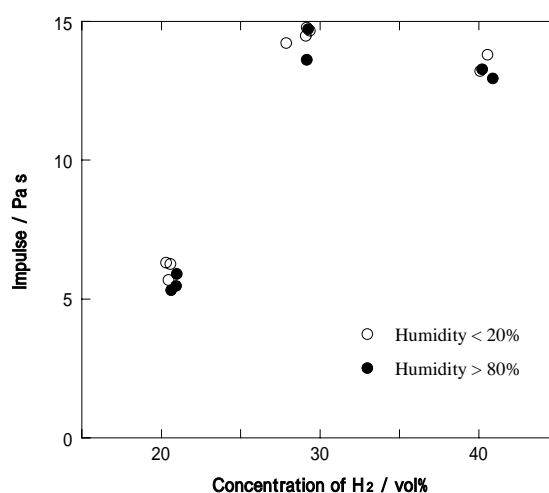


Fig. 2. Effect of Water Vapor on Impuls