

## Identification of the occupancy in the hydrate lattice for ternary $C_2H_6 + H_2 +$ water system

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A recently reported clathrate hydrate of hydrogen, requiring only water and gas, indeed does meet the storage and cost requirements, however, the extreme pressures ( $\sim 2$ kbar) required to produce the material make it impractical. While pure ethane is known to form structure I hydrate, pure hydrogen is known to form structure II hydrate. Recently tetrahydrofuran (THF) has been receiving growing attention as a novel promoter for hydrogen storage. However, THF is a volatile organic solvent used in process as well as structure II hydrate former by itself with water. In this work,  $C_2H_6$  was studied as a new promoter for hydrogen storage. Raman spectroscopy,  $^1H$  NMR, X-ray diffraction and direct measurements of gas content have shown that structure I gas hydrates, with the large cage occupied by  $C_2H_6$  molecule, can form easily at  $\sim 100$  bars and near-ambient temperatures in the small cavities.