

Green Gas Hydrate Inhibitors?

Virginia K. Walker

Department of Biology,

Queen's University

Kingston, Ontario, Canada K7L 3N6

with co-authors: Nagu Daraboina, Rai Gordienko, Hiroshi Ohno, John Ripmeester and Peter Englezos

Certain proteins that have evolved over millennia to adsorb to ice also appear to interact with the crystalline ice-like cages of water that house small gases, or gas hydrates. Gas hydrates are probably best known for the vast underground reserves that will undoubtedly offset the world's future energy thirst, but they also represent a threat to local ecosystems due to the danger posed by their unexpected and catastrophic formation in pipelines, and during drilling operations and transport. The most popular commercial gas hydrate inhibitors are themselves toxic, making the discovery of 'green' hydrate inhibitors a high priority. As a result, we have embarked on a challenging program to compare hydrate inhibition efficacy, as well as the inhibition mechanisms of commercial and biological kinetic inhibitors. Antifreeze proteins clearly adsorbed to model hydrates. Nevertheless, natural gas hydrate formed in the presence of recombinant antifreeze proteins (AFPs) and a commercial gas hydrate inhibitor (polyvinylpyrrolidone, PVP) appeared to be different. Compared to the PVP system, there was a decrease in cage occupancy by gas guests with AFPs, which may also explain the shorter decomposition times. Therefore, these two classes of inhibitors appear to be distinct and as a consequence their inhibition mechanisms as well as their practical utility in the field are likely to be marked by important differences.

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