Kinetic inhibition mechanism of CO_2 hydrate formation

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In the previous study, we confirmed the potential of amino acids as THI(thermodynamic hydrate inhibitor)s for CO_2 hydrate formation. Along with this, we also suggest amino acids as KHI(kinetic hydrate inhibitor)s which means that they have dual functions on the hydrate inhibition. To confirm their capabilities, the nucleation and growth kinetics of CO_2 hydrate formation in the presence of L-alanine, L-leucine, L-serine, L-aspartic acid, L-asparagine, L-phenylalanine, and L-histidine were observed. In investigating the kinetic inhibition mechanism of CO_2 hydrate formation, amino acids are great model systems to compare the effects of each functional group due to the intrinsic nature of their structures. From the results, it was concluded that there are clear differences in inhibiting performances between various functional groups. Also, the zwitterion formation for amino acids when they are dissolved in water enable some of them to be efficeint KHIs. These kind of fundamental understandings on inhibition mechanism will give us a key knowledge to design and utilize new KHIs.