INFRARED SPECTROSCOPY OF $M^{+}(CH_4)_n(H_2O)_{3-4}$ CLUSTERS (M=Li, Na): INDUCING $H_2O\cdots H_2O$ AND $H_2O\cdots CH_4$ HYDROGEN BONDS IN METHANATED CLUSTERS

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Experiments on $M^{+}(CH_4)_n(H_2O)_{3-4}$ (M=Li and Na) have been carried out using tandem mass spectrometry and infrared spectroscopy in the O-H stretching region from 3400 cm^{-1} to 3800 cm^{-1}. We have found, for example, that a single CH_4 can induce hydrogen bonded conformers in the cases of $Li^{+}(CH_4)_1(H_2O)_3Ar_{0-1}$, which are absent in the $Li^{+}(H_2O)_3Ar_{0-1}$ spectra[a,b]. Furthermore, upon addition of multiple CH_4 ligands, hydrogen bonding is not only maintained, but features associated with $H_2O\cdots CH_4$ hydrogen bonds are more intense, indicating the affinity of CH_4 to bind to available O-H sites. Spectra of $Li^{+}(CH_4)_{1-3}(H_2O)_4$ and $Na^{+}(CH_4)_{1-3}(H_2O)_{3-4}$ clusters will also be discussed, all of which exhibit the curious trait of $H_2O\cdots H_2O$ and $H_2O\cdots CH_4$ hydrogen bonding in the presence of hydrophobic, non-polar CH_4. To better understand the nature and onset of $H_2O\cdots CH_4$ hydrogen bonding, the $Li^{+}(CH_4)_n(H_2O)_{1-2}$ spectra will be discussed.

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[a] D.J. Miller and J.M. Lisy *J. Am. Chem. Soc.* **130**, 15381 (2008).
[b] D.J. Miller and J.M. Lisy *J. Am. Chem. Soc.* **130**, 15393 (2008).