

## INFRARED PHOTODISSOCIATION SPECTROSCOPY OF PROTONATED METHANOL CLUSTER IONS

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Photodissociation spectra of the protonated methanol cluster ions,  $\text{H}^+(\text{CH}_3\text{OH})_n$  ( $n = 4 - 8$ ), were measured in the range of  $900 - 2300 \text{ cm}^{-1}$  by using an infrared free electron laser. A broad spectral feature was observed at about  $1600 \text{ cm}^{-1}$  in each spectrum. We assign this feature to the  $\text{OH}^+$  stretching vibration, which is coupled with the OH bending motion in the  $\text{HOH}^+$  group. The small vibrational wavenumber suggests that the  $\text{O-H}^+$  bond is very weak.

Structure optimizations by the density functional theory show that  $\text{H}^+$  is equally shared by two oxygen atoms at  $n = 4, 5$ . This result also demonstrates the weak bonding between  $\text{H}^+$  and oxygen. The binding features of  $\text{H}^+$  in the cluster ions will be discussed.