NEAR-INFRARED SPECTROSCOPY OF DISSOCIATED NAPHTHALENE IN A RADIOFREQUENCY PLASMA

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Polycyclic aromatic hydrocarbons (PAHs) are abundant organic molecules detected in several objects in the universe, such as molecular clouds in the interstellar medium (ISM) [a]. Their structure can be modified through plasma-driven processes occurring in the ISM. The present study focuses on the dissociation of naphthalene ($C_{10}H_8$) in a radiofrequency (RF) plasma, probed using cavity ringdown spectroscopy (CRDS) in the near-infrared. Namely, the low-power RF plasma source, called Platypus, is adapted from a small plasma thruster ("Pocket Rocket") designed by the Space Plasma Power and Propulsion laboratory of the ANU [b]. A stable supersonic jet plasma is generated by expanding a mixture of argon and dissociated $C_{10}H_8$ into a vacuum chamber through a 20 mm long, 4 mm wide slit nozzle [c]. The jet-cooled fragmented $C_{10}H_8$ is finally probed with the ultra-sensitive CRDS technique. We recorded a spectrum from 5950 to 6120 cm^{-1} composed of several hundred transitions originating from many different molecules, radicals, and probably ions [d].

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[d] M. Alliati et al., The Journal of Physical Chemistry A 123.10, 2107-2113 (2019).