Large protonated polycyclic aromatic hydrocarbons (H+PAH) and polycyclic aromatic nitrogen heterocycles (H+PANH) have been proposed as possible carriers of unidentified infrared (UIR) emission bands from galactic objects. The nitrogen atom in H+PANH is expected to induce a blue shift of the C=C stretching band near 6.2 μm so that their emission bands might agree with the UIR band better than those of H+PAH.

In this work, we report the IR spectrum of protonated quinoline and its neutral species measured upon electron bombardment during deposition of a mixture of quinoline and para-hydrogen at 3.2 K. New features were assigned to 1-C9H7NH+ and 1-C9H7NH, indicating that the protonation and hydrogenation occur at the N-atom site. The intensities of features of 1-C9H7NH+ diminished when the matrix was maintained in darkness for 10 h, whereas those of 1-C9H7NH increased. Spectral assignments were made according to comparison of experimental results with anharmonic vibrational wavenumbers and IR intensities calculated with the B3LYP/6-311++G(d,p) method. Although agreement between the observed spectrum of 1-C9H7NH+ and the UIR emission bands is unsatisfactory, presumably because of the small size of quinoline, we did observe C=C stretching bands at 1641.4, 1598.4, 1562.0 cm⁻¹, blue-shifted from those at 1618.7, 1580.8, 1510.0 cm⁻¹ of the corresponding protonated PAH (C10H9+), pointing to the direction of the UIR bands.