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Generation and Characterization of HgBr Radical in Low Temperature Atmospheric Pressure Plasma Jets. PUBUDUNI A K EKANAYAKA M E W, CHUJI WANG, Mississippi State University Department of Physics and Astronomy — Numerous ongoing studies of metal halide molecules such as HgBr radicals have been driven by their application in light source and its important roles in atmospheric mercury chemistry. Formation and characterization of HgBr radicals in two types of low temperature plasma were studied in this work. Chemical vapor of mercury bromide ($HgBr_2$) was generated using a high temperature (>100 °C) heating of a solid $HgBr_2$ sample held in a pyrex tube and was introduced to a low temperature atmospheric microwave wave plasma jet (MWPJ) and a cold atmospheric pulsed plasma jet (APPJ) using He as a carrier gas. By controlling the plasma operating conditions (plasma power, applied pulse voltage, gas flow rate, etc.), we observed Hg atomic and HgBr radical emission spectra. The atomic Hg and Br were formed in both plasma jets; but HgBr radicals were formed only in the cold plasma jet. Optical emission spectra of Hg and HgBr were obtained vertically along the axis of the plasma jet to validate their formation in the plasma. The strongest band in the vibronic spectrum was observed at 502 nm, which belongs to the electronic system$(V' = 0- \rightarrow V'')B^2\Sigma^+_{1/2} \rightarrow \mathrm{X}^2\Sigma^+_{1/2}$ of HgBr radical. We speculate that the plasma thermal dissociation and electron impact dissociation of $HgBr_2$ molecules are responsible for the generation of HgBr radicals and that the high temperature of MWPJ (400-800 K) further dissociates HgBr radicals into Hg and Br atoms, so that no HgBr was observed in the MWPJ.

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