

Rayleigh scattering as a measurement of mean argon cluster size in a planar supersonic expansion

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We have been investigating argon excimer emission from a pulsed discharge excited argon planar supersonic expansion. While vibrationally cooled argon excimer emission is observed, the pressure within the expansion is too low to support formation of the excimers by conventional mechanisms. We have hypothesized that the excimer formation mechanism involves large molecular argon clusters with a mean size of approximately 10,000 atoms/cluster.

An all optical method employing Rayleigh scattering is presented as the first evidence of the presence of large clusters in a planar expansion. Scattering is produced by a 532nm diode pumped 17mW CW Nd:YAG laser transversely incident to the gas flow with the scattered radiation collected by a Photomultiplier tube. The scattering signal is studied as a function of gas backing pressure P_0 , position within the expansion jet, gas pulse width, and nozzle slit width.

