Dynamics Of A Laser-ablated Molybdenum Plume

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It was evaluated the dynamics of neutral excited and singly ionized electronic states of laser-ablated molybdenum plume generated in air, by emission spectroscopy. It was determined the evolution of electronic temperature along the plume expansion axis, plasma expansion velocity, plasma lifetime and plume length.

Assuming the Local Thermal Equilibrium approximation, using the Boltzmann plot method for neutral Mo spectral lines and Saha-Boltzmann plot method for ionized Mo lines, the average electronic excitation temperature was calculated to be around 10000 K. The temperature was obtained for different positions along the expansion axis and allowed to verify the dynamics of plume expansion. The temperature reaches a maximum value in the inner of the plume and decays at the boundaries. Other parameters were calculated, such as: plasma expansion velocity (5.0 ± 0.7) km/s, plasma lifetime (160 ± 14) ns and plume length (0.70 ± 0.05) mm.

Furthermore, it was determined the evolution of the excited states. It reveals that, near of metal surface, light emission is predominantly due transitions between ionized states, whereas at the end of the plume it is due transitions to the ground state.