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Kinetic Global Modeling of Rare Gas Lasers[1] GUY PARSEY, JOHN VERBONCOEUR, ANDREW CHRISTLIEB, Michigan State University — Akin to diode-pumped alkali metal lasers, electronically excited states of rare gases (e.g. Ar and Kr) have been shown to operate as chemically inert three-level gain media for an optically pumped laser system. As opposed to vaporization heating, these systems rely on electric discharge to efficiently maintain a population of metastable states acting as the bottom laser level. We propose that a modified electron energy distribution (EEDF) in the electric heating can tune optically pumped rare gas laser (OPRGL) efficiencies. The EEDF factors into all plasma phase chemistry within the underlying reaction network, and is assumed to be maintained by discharge and electron sources. Using parameter scanning methods within the kinetic global modeling framework (KGMf), optimized EEDFs are found for metastable production and increasing OPRGL operational efficiencies. Finally, we investigate the feasibility of using a modified EEDF to drive a rare gas laser system without optical pumping.

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