ENERGY POOLING, ION RECOMBINATION, AND REACTIONS OF RUBIDIUM AND CESIUM IN HYDROCARBON GASSES.

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Diode Pumped Alkali Lasers (DPAL) are continuous wave lasers, potentially capable of megawatt average powers. These lasers exploit the D1 and D2 lines of alkali metals resulting in a 3-level laser with the lasing transition in the near infrared region of the electromagnetic spectrum. Energy pooling processes involving collisions between excited alkali metals cause a fraction of the gain media to be highly excited and eventually ionized. These high energy cesium atoms and ions chemically react with small hydrocarbons utilized as buffer gasses for the system, depleting the gain media. A kinetic model supported by experimental data is introduced to explain the cumulative effects of optical trapping, energy pooling, and chemical reactivity in heavy alkali metal (Rb, Cs) systems. Spectroscopic studies demonstrating metal hydride formation will also be presented.