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Excitation of atomic zinc during excimer laser ablation of zinc oxide at 193 nm ENAMUL KHAN, STEPHEN LANGFORD, THOMAS DICKINSON, Washington State University — Atomic excitations during UV laser ablation usually involve collisions with energetic electrons. When zinc oxide is ablated with a 193 nm excimer laser, we observe light emission at pulse energies —well below the threshold for normal electron heating processes. At pulse energies near the threshold for visible light emission, the source is localized and moves away from the surface at a nearly constant velocity. Time-resolved quadrupole mass spectrometry confirms the presence of zinc atoms with velocities consistent with this motion. We propose that these excited zinc atoms are generated by two-photon excitation into the autoionizing $3d^{10}4p\ (^2P^\circ_{3/2})\ 5s\ \ ^2[3/2]^\circ$ state of atomic zinc at 103 001 cm^{-1}. The broad "window resonance" associated with this state in single-photon absorption is associated with a *drop* in absorption, because the main decay channel (ionization) is hindered by destructive interference effects. We propose that radiative decay, which is otherwise a minor decay channel, produces bound excited states that subsequently decay to yield the observed light.

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