

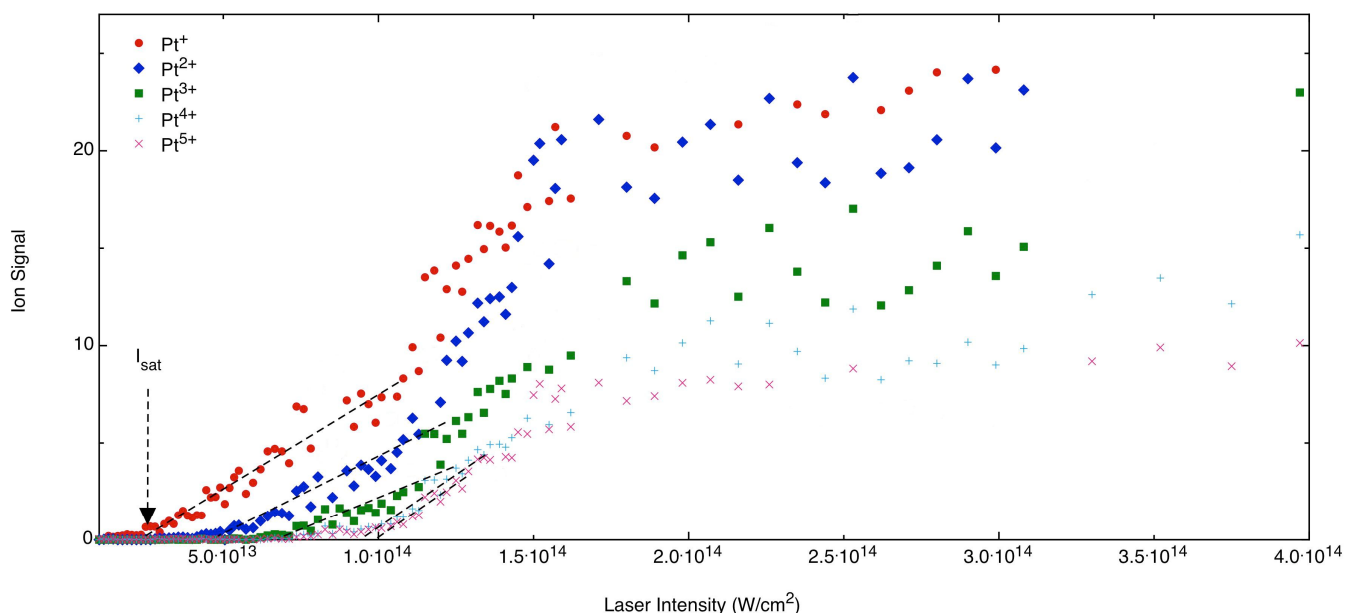
## Ultrafast Ionization and Subsequent Coulomb Explosion of Zirconium Oxide and Tungsten Carbide “Superatomic” Cluster Species and Comparison to Group 10 Metals

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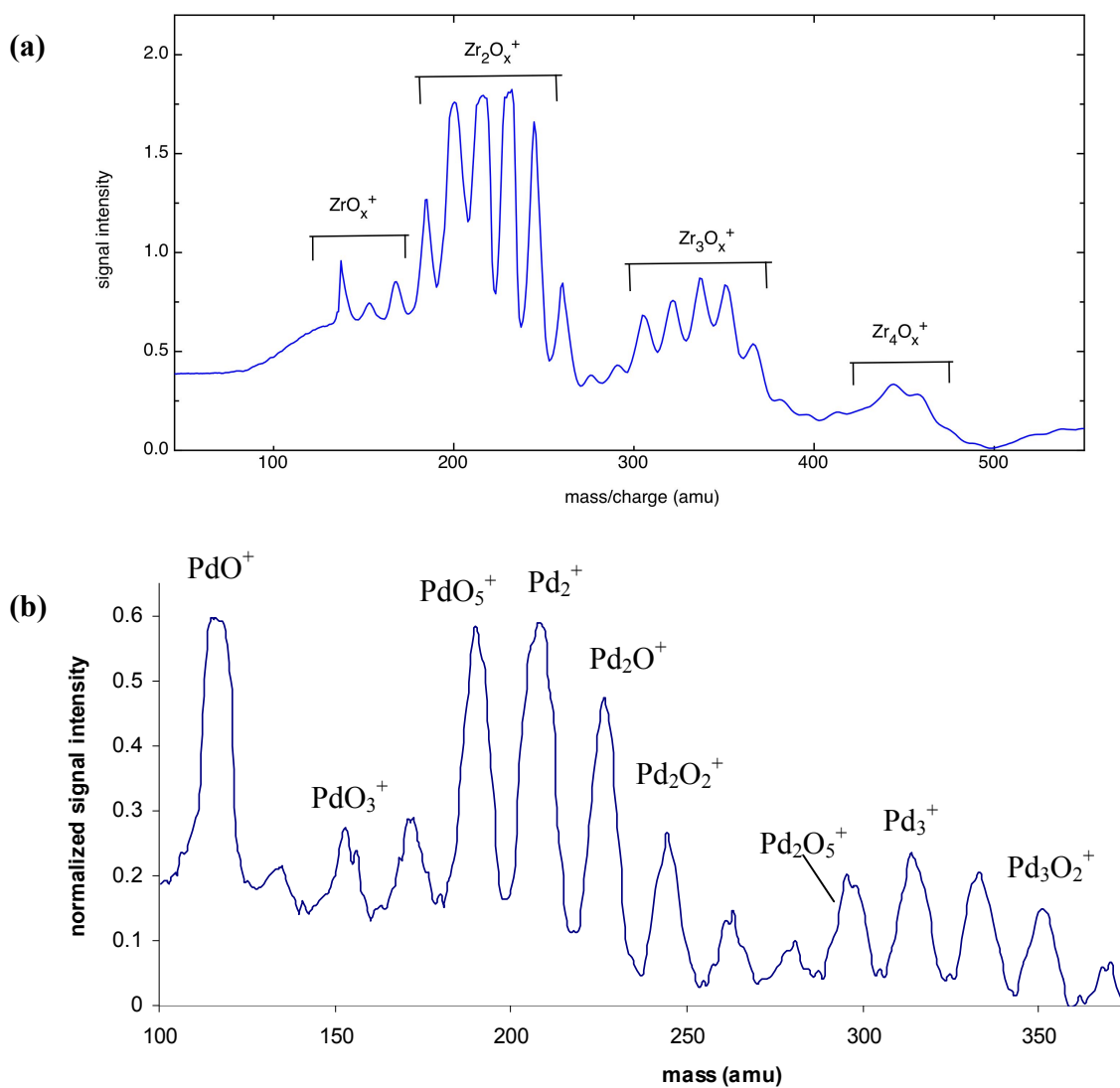
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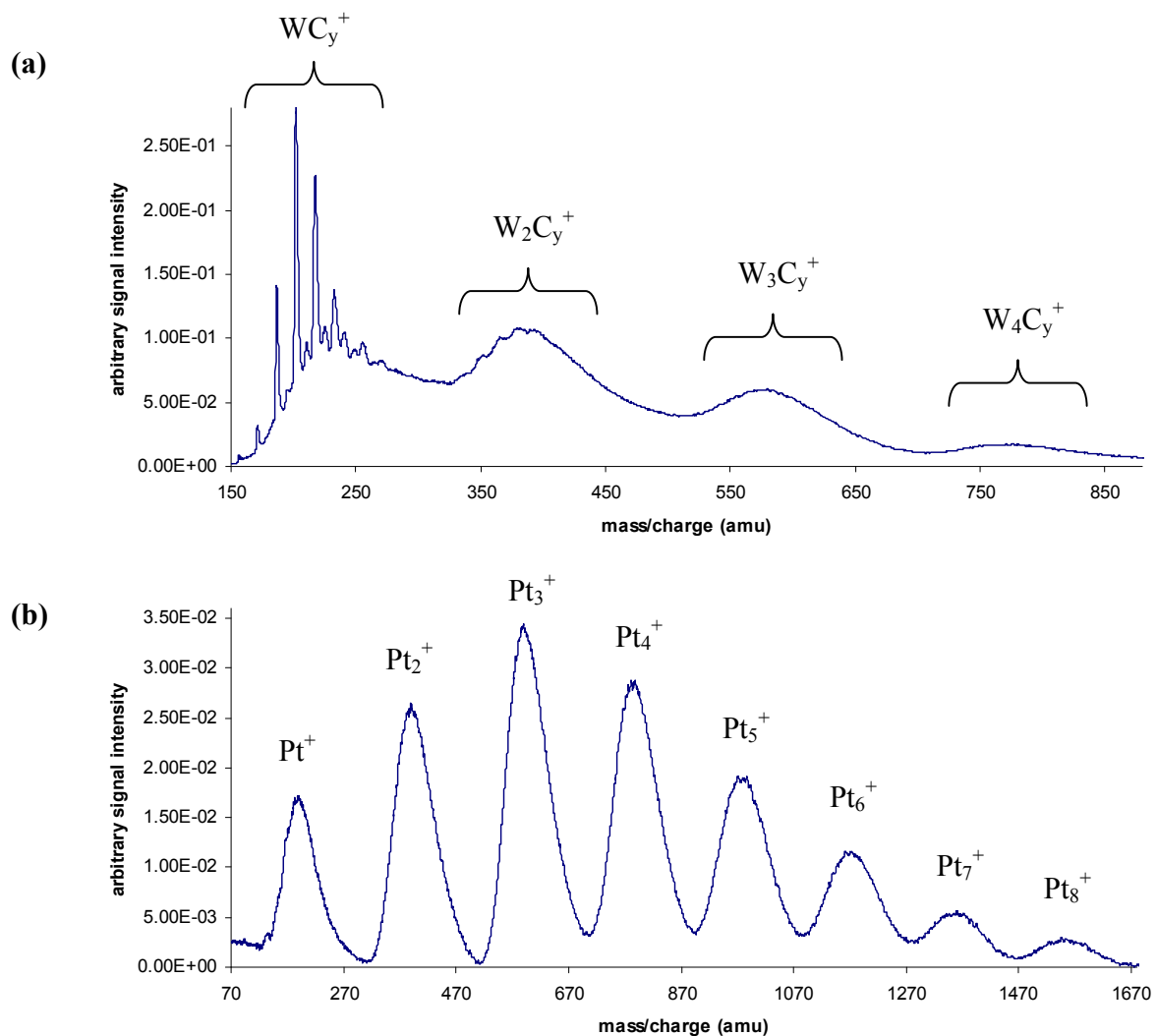
### Supporting Information



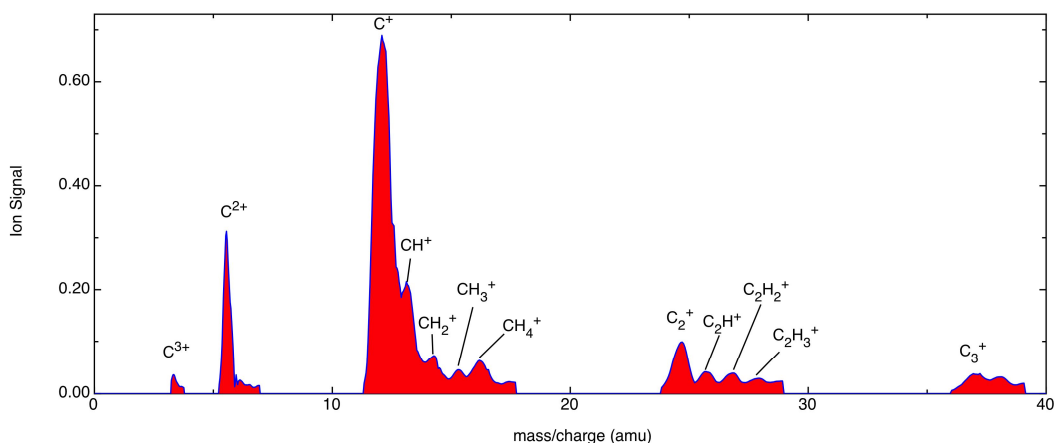
**Figure S1:** Extraction of saturation intensities ( $I_{\text{sat}}$ ) using a best fit line on a linear plot of ion signal. When the probability of ionization becomes unity for an ion state, ion signal changes from exponential to linear behavior and a straight line (dotted) drawn back to the x-axis is used to extract the saturation intensity within a range of  $\pm 3 \times 10^{12}$   $\text{W}/\text{cm}^2$ .



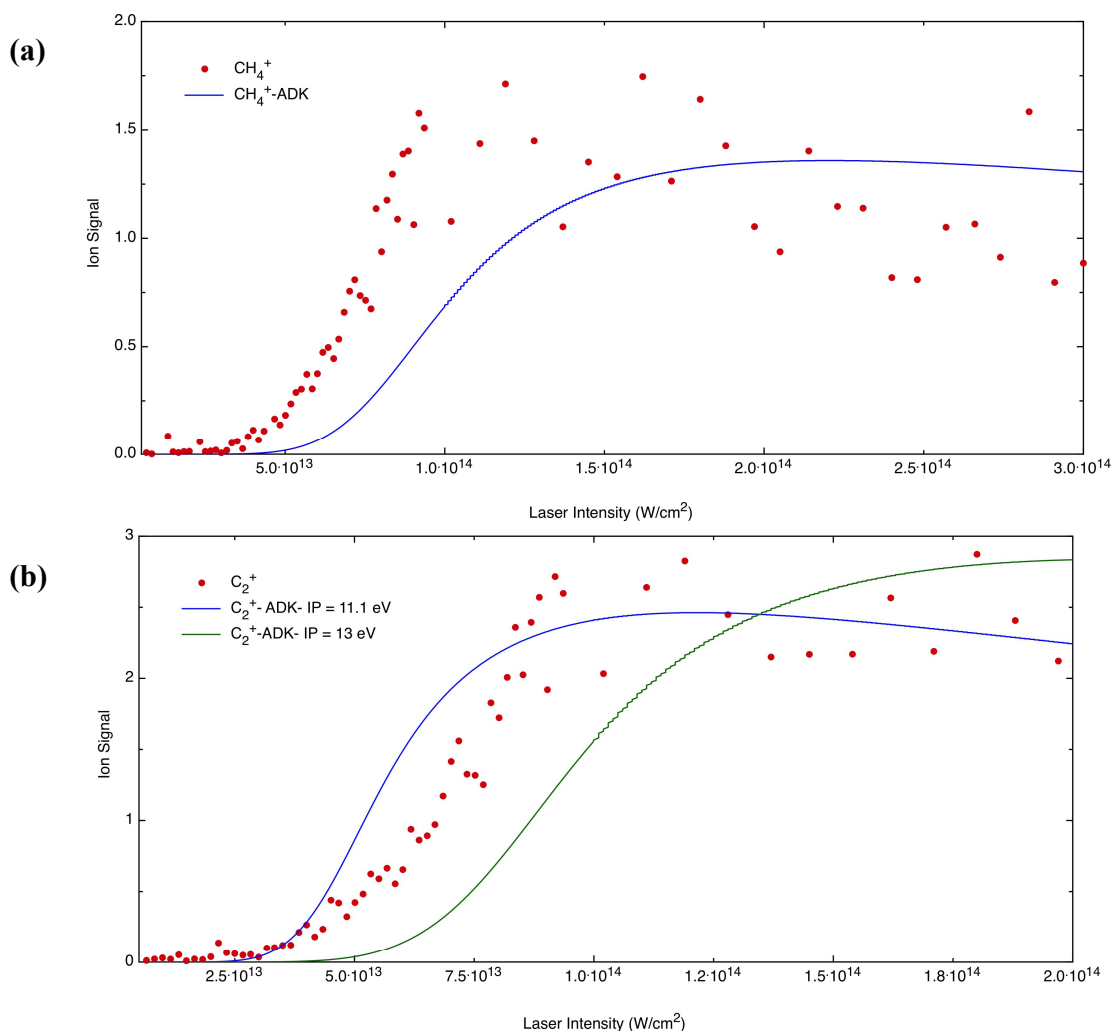
**Figure S2:** Cationic distribution of (a) small zirconium oxide clusters (b) small palladium oxide clusters detected by pulsing the TOF ion optics.



**Figure S3:** Cationic distribution of (a) small tungsten carbide clusters (b) small pure platinum clusters detected by pulsing the TOF ion optics.



**Figure S4:** Carbon clusters formed from pulsing methane gas over tungsten metal.



**Figure S5:** (a) methane ISS curve (dots) vs. sequential ionization potential predicted from ADK theory (solid line). (b) C<sub>2</sub><sup>+</sup> ISS curve (dots) with an ADK-fit ionization potential of 11.1 eV.