

THRESHOLD IONIZATION SPECTROSCOPY AND SPIN-ORBIT COUPLING OF  $\text{CeC}_3\text{H}_4$  and  $\text{CeC}_3\text{H}_6$  FORMED  
in  $\text{Ce} + \text{PROPENE}$  REACTION

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$\text{CeC}_3\text{H}_4$  and  $\text{CeC}_3\text{H}_6$  are observed in the reaction of Ce with propene in molecular beams and characterized by mass-analyzed threshold ionization (MATI) spectroscopy and relativistic quantum calculations. The MATI spectrum of each species displays two band systems, each consisting of vibronic progressions from Ce-C stretching and ligand bending excitations in the ionic states. The adiabatic ionization energies of  $\text{CeC}_3\text{H}_4$  and  $\text{CeC}_3\text{H}_6$  are 41035 (5) and 41868 (5)  $\text{cm}^{-1}$ , respectively. The two band systems are separated by 125  $\text{cm}^{-1}$  for  $\text{CeC}_3\text{H}_4$  and 60  $\text{cm}^{-1}$  for  $\text{CeC}_3\text{H}_6$ . By comparing the splittings from the spectra with the relativistic calculations at the level of multiconfiguration quasi-degenerate second-order perturbation theory, we assign the two band systems to transitions from two spin-orbit levels of the neutral molecules.