

## DEHYDROGENATION AND C-H BOND INSERTION OF PROPENE: $\text{La}(\eta^2\text{-C}_3\text{H}_4)$ AND $\text{HLa}(\eta^3\text{-C}_3\text{H}_5)$

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Dehydrogenation and C-H bond insertion are observed in the reaction of laser-ablated La atoms with propene ( $\text{C}_3\text{H}_6$ ) in a pulsed molecular beam source. Several dehydrogenated and inserted products are identified by the time-of-flight mass spectrometry.  $\text{La}(\text{C}_3\text{H}_4)$  formed from  $\text{H}_2$  elimination and  $\text{HLa}(\text{C}_3\text{H}_5)$  formed by C-H bond insertion are characterized by pulsed-field-ionization electron and ion spectroscopy, in combination with density functional theory. Two isomers of  $\text{La}(\text{C}_3\text{H}_4)$  are identified from 1,2- and 1,3-dehydrogenation. The adiabatic ionization energies of 1,2- and 1,3-dehydrogenated isomers are measured to be 40506(5) and 40941(5)  $\text{cm}^{-1}$ , respectively. For the inserted product  $\text{HLa}(\text{C}_3\text{H}_5)$ , La atom is bound to the allyl radical in a three-fold binding mode ( $\eta^3$ ). It is observed that the ionization energy of the  $\text{HLa}(\eta^3\text{-C}_3\text{H}_5)$  insertion complex (41130(5)  $\text{cm}^{-1}$ ) is close to that of the 1,3-dehydrogenated  $\text{La}(\eta^2\text{-C}_3\text{H}_4)$  species.