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GAS PHASE SYNTHESIS AND REACTIVITIES OF SOME SILVER CLUSTERS

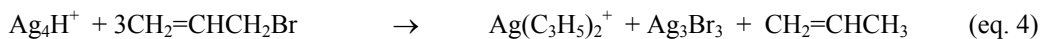
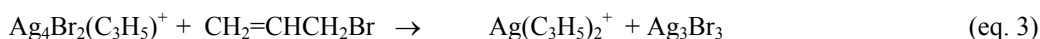
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Metal clusters play a role, among others, in heterogeneous catalysis [1] and the significance of their study in the gas phase lies in establishing a link between the gas and condensed phase chemistries.

The formation of stable clusters of silver and silver hydride cations was observed in an ion trap mass spectrometer. These clusters were synthesized (via self assembly) using multiple stage mass spectrometry (MS^n) on a modified commercial ion trap mass spectrometer. The precursor ions were silver complexes with an amino acid of the type $[(M + Ag - H)_n + Ag]^+$, where M = amino acid, and the clusters obtained were identified as Ag_3^+ , Ag_5^+ , Ag_7^+ , Ag_2H^+ , Ag_4H^+ and Ag_6H^+ .

Their rich ion-molecule reactions with allyl halides (C_3H_5X , X = Cl, Br, I) and with other reagents such as alcohols and amines are highlighted. It was observed that all clusters mainly condense C_3H_5Cl molecules. In contrast, C_3H_5Br reacts selectively with Ag_4H^+ , Ag_5^+ and Ag_6H^+ , where its sequence of reaction with Ag_4H^+ is highlighted (eqs. 1-4) [2]. Importantly, the product of the C-C coupling reaction observed in this case was shown to be the 1,5-hexadiene consistent with the chemistry on silver surfaces [3]. C_3H_5I reacted with all the metal clusters studied, mainly via cleavage of the C-I bond. Clusters with mixed metallic/ionic characters are also reported along with the formation of organometallic compounds like $Ag(C_3H_5)_2^+$ and $Ag_2C_3H_5^+$.



References:

- 1- Braunstein P.; Oro L. A.; Raithby P. R. Editors, *Metal Clusters in Chemistry*, Wiley-VCH, 1999, v2.
- 2- Khairallah G. N.; O'Hair R. A. J., *Angew. Chem. Int. Engl. Ed.*, in press
- 3- Zhou X.-L.; White J. M.; *J. Phys. Chem.*, 1991, 95, 5575-5580