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Study of III-V Semiconductor Clusters using Anion Photoelectron Spectroscopy UJJWAL GUPTA, Pennsylvania State University, J. ULISES REVELES, Virginia Commonwealth University, JOSHUA MELKO, Pennsylvania State University, SHIV KHANNA, Virginia Commonwealth University, A.W. CASTLEMAN JR., Pennsylvania State University — III-V semiconductor materials are used in various electronic applications. III-V clusters are therefore a subject of extensive investigation because of the desired capability to fine tune the properties in a bottom-up approach. Evidence for band gap tunability is presented as one of the examples here. It is shown that changing the amount of gallium, changes the band gap in $Bi_3Ga_y^{(-)}$ clusters. Now, depending upon how stable the cluster is for a given band gap it can be used to assemble nanomaterials. It is found that $Bi_3Ga_2^-$, Bi_3Ga_3, $Bi_3Ga_4^-$ and Bi_3Ga_5 are stable with a calculated band gap ranging from 1.17 eV to 1.89 eV, using mass spectrometry, photoelectron spectroscopy and computational results. Additionally, it is shown that the electronic properties remain similar when an element from III-V cluster is replaced with another from the same group. This gives an opportunity to fine tune the material further depending upon the requisite physical properties. In this context, the example given is for gallium in Bi_xGa_y clusters replaced with indium to make Bi_xIn_y clusters. The electronic properties remain similar but unlike gallium, indium is not a liquid at room temperature which makes indium relatively easier to handle.

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