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Covalent Attachment to GaP(110) – Engineering the Chemical Functionalization of a III-V Semiconductor A.J. BRADLEY, UC Berkeley, Dept of Physics, M.M. UGEDA, UC Berkeley, Dept of Phsyics; JCAP, LBNL, WENJUN LIU, UC Berkeley, Dept of Chemistry; JCAP, LBNL, MIN YU, JCAP, LBNL; Materials Science Division, LBNL, T. DON TILLEY, UC Berkeley, Dept of Chemistry, RUBÉN PÉREZ, Dept. Física Teórica de la Materia Condensada, UAM, Madrid, JEFFREY B. NEATON, M.F. CROMMIE, UC Berkeley, Dept of Physics; Materials Science Division, LBNL — With its 2.3 eV bulk bandgap, relatively high conduction band edge, and low chemical reactivity, the (110) surface of GaP is an excellent candidate for many UV and visible light applications, such as photo-catalysis and light-induced chemical reduction. However, the reconstruction and resulting charge transfer of the surface makes it difficult to covalently attach the required molecules. Indeed, very little work has been done to understand either covalent functionalization or passivation of this surface. Here we report on a Staudinger-type, thermally-driven covalent attachment of perfluorophenyl azide (pfpa) to GaP(110). We have studied the adsorption of pfpa molecules by means of high-resolution scanning tunneling microscopy and spectroscopy in combination with first principles calculations. We show a progression from a physisorbed state at room temperature to a covalently attached state after exposure to slightly higher temperatures ($\sim 50°$C). The developed approach is expected to be valid for various other functional groups attached to the azide, as well as other III-V semiconductors.

[1] J.L.A. Alves, et. al.*Phys. Rev. B.*, 6188-6198.
[2] M.M. Ugeda, et. al.*J. Phys. Chem. C.*(accepted November 2013).

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