

**SUBSTRATE ENHANCED STABILITY OF HYDROGEN ADSORPTION COMPLEXES ON  
GRAPHENE ON Ir(111)**

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**Abstract**

We present combined temperature programmed desorption (TPD) and X-ray photoelectron spectroscopy (XPS) measurements on the interaction of hydrogen with graphene supported on Ir(111). The TPD measurements show a substrate enhanced stability of hydrogenated graphene compared to hydrogenated graphite. XPS measurements reveal an increased interaction between the graphene layer and the underlying Ir(111) surface following hydrogen adsorption. TPD and XPS measurements indicate that graphene undergoes a significant structural change upon hydrogen treatment. The presented results support the hypothesis that the hydrogenation of graphene on Ir(111) leads to the formation of areas with graphane-like local  $sp^3$  bonding.