

## Electronic properties of nitrogen doped graphene measured at the atomic scale

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Chemical doping is a promising strategy for tailoring the electronic properties of graphene. The incorporation of nitrogen in the carbon lattice is a natural choice because of its suitable atomic radius and additional electron. The substitution of some carbon atoms by nitrogen is expected to give rise to a shift of the Dirac energy and an additional donor states. The local environment of the doping sites can also lead to various effects in the graphene electronic structure [1]. Experimentally, the link between the local atomic structure and electronic properties can be achieved using scanning tunneling microscopy (STM) and spectroscopy (STS) by combining atomic scale imaging with local spectroscopy. Using STM/STS operating in ultra high vacuum and at low temperature, we have investigated nitrogen doped graphene grown on SiC(000-1). Substitutional nitrogen has been found to be the most common configuration observed characterized by a specific triangular pattern similarly to the recently reported STM/STS study of N doped graphene prepared by chemical vapor deposition on a copper substrate [2]. The spatial distribution of the local density of states in high resolution images indicates a charge transfer between the nitrogen atom and its neighboring carbon atoms. Local spectroscopy reveals that doping induces a shift of the Dirac energy as expected for n-doping together with the formation of an additional localized state in the valence band. This finding is in agreement with Density Functional Theory (DFT) calculations. Beside the observation of single substitutional nitrogen atoms, various other atomic configurations have been observed revealing different electronic properties.

### References

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