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Graphene nanopatterning with 2.5 nm precision: combining bottom-up and top-down techniques JOSE M. GOMEZ-RODRIGUEZ, ANTONIO J. MARTINEZ-GALERA, IVAN BRIHUEGA, Dept. Fisica de la Materia Condensada, Universidad Autonoma de Madrid, Spain, ANGEL GUTIERREZ-RUBIO, TOBIAS STAUBER, Instituto de Ciencia de Materiales de Madrid, CSIC, Spain — The selective modification of pristine graphene represents an essential step to fully exploit its potential. Here we merge bottom-up and top-down strategies to tailor graphene with nanometer accuracy. In a first step, graphene electronic properties are macroscopically modified using the periodic potential generated by the self assembly of metal cluster superlattices on a graphene/Ir(111) surface. Then, we show that individual metal clusters can be selectively removed at room temperature by a STM tip with perfect reproducibility, which enables one to nanopattern the system down to the 2.5 nm limit given by the distance between neighbouring clusters, i.e., the periodicity of the moire-pattern. The method can be carried out on micrometer sized regions, with clusters of different materials -which allows tuning the strength of the periodic potential- and the structures so created are stable even at room temperature. As a result, we can strategically combine graphene regions that should present large differences in their electronic structure to design graphene nanostructures with specific functionalities.

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