This PhD project is a part of Center for Nanostructured Graphene (CNG) activities. The aim of the project is to develop a new lithography method for creation of highly ordered nanostructures with as small as possible feature and period sizes. The method should be applicable for graphene nanostructuring and allow electronic transport studies afterwards. To achieve this goal self-assembly properties of block copolymers are exploited. Micro phase separation in block copolymers can provide well-defined morphologies with nanometer-size features. A new lithography method utilizing ex-situ fabricated polymer masks is developed. Mask fabrication is realized by microtoming of 30-60 nm thin sections from pre-aligned polymer monoliths with different morphologies. The resulting polymer masks are then transferred to both silicon and graphene substrates. Hexagonally packed hole patterns with 10 nm hole diameter and 20 nm periodicity are successfully transferred to both substrates. The method allowed to realize the first ever transfer of moiré patterns to silicon. Furthermore, in collaboration with CNG, device with nanostructured graphene are fabricated and electrical measurements made on these devices demonstrated the opening of what could be interpreted as a band gap.

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