

# Transfer processes of graphene and other 2D materials

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## Abstract

The great challenge today to generating application for graphene and the others 2D materials is the transfer process. Graphene and others 2D material can be produced mainly by micromechanical exfoliation (ME), chemical exfoliation (CE) and Chemical Vapor Deposition – CVD<sup>1,2</sup>. Micromechanical exfoliation generating a large number of flakes of 2D that are deposited under substrates randomly distributed<sup>3</sup>. Chemical exfoliation products flakes disperse in solutions and they have to be placed to the final substrate target. CVD technique can produces large area of 2D materials when compared with the ME and CE, however, the removal of the 2D from the metal substrate and transfer to the substrate still have some limitations due to the presence of a chemical etching step, cracks, wrinkles and the area of 2D material transferred<sup>4,5</sup>. The Polymer & 2D Materials Interactions research group from Mackgraphé (Graphene and Nano-materials Research Center) has developed several techniques to transfer different 2D materials to several substrates. These techniques included Micromechanical Exfoliation assisted by Polymeric Stamp (ME-PS), Direct Dry Transfer (DDT) and its developments: Direct Dry Transfer assisted by Spin-coater (DDT-SC) and Direct Dry Transfer by *in situ* Polymerization (DDT-IP). ME-PS improves the standard micromechanical exfoliation by the ease with which are obtained 2D materials flakes with few layers (graphene, MoS<sub>2</sub> and black phosphorus). The Direct Dry Transfer methods allow transfers of large areas of CVD 2D materials without etching step to soft and hard substrates. The evaluation of the new routes was performed by Optical Microscopy, Raman Spectroscopy and Atomic Force Microscopy.

## References

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