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# Patterning Graphene Film by Magnetic-assisted UV Photochemical Oxidation

Patterning graphene film is a significant step in fabricating graphene-based elements in optoelectronics. In this talk, I will present a feasible solution, including our recent breakthrough progress, to make graphene patterns by magnetic-assisted UV photochemical oxidation that overcomes the obstacles of organic contamination, linewidth resolution, and substrate damaging [1-4]. During this process, the photodissociated paramagnetic oxidative radicals are magnetized and they form directional motions in an inhomogeneous external magnetic field. As a consequence, the directional and enhanced oxidation of these radicals facilitate graphene patterning. Using a ferromagnetic steel mask, a certain inhomogeneous vertical magnetic-field-assisted UV photochemical oxidation has a capability of patterning graphene microstructure with a line width of 20 μm and lateral under-oxidation less than 1 μm. This approach can be applied to fabricate graphene field-effect transistor and photodetector arrays. Magnetic-assisted UV photochemical oxidation should be a promising solution toward resist-free, substrate non-damaging, and cost-effective fabrication of graphene microstructures.

## References

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## Figures

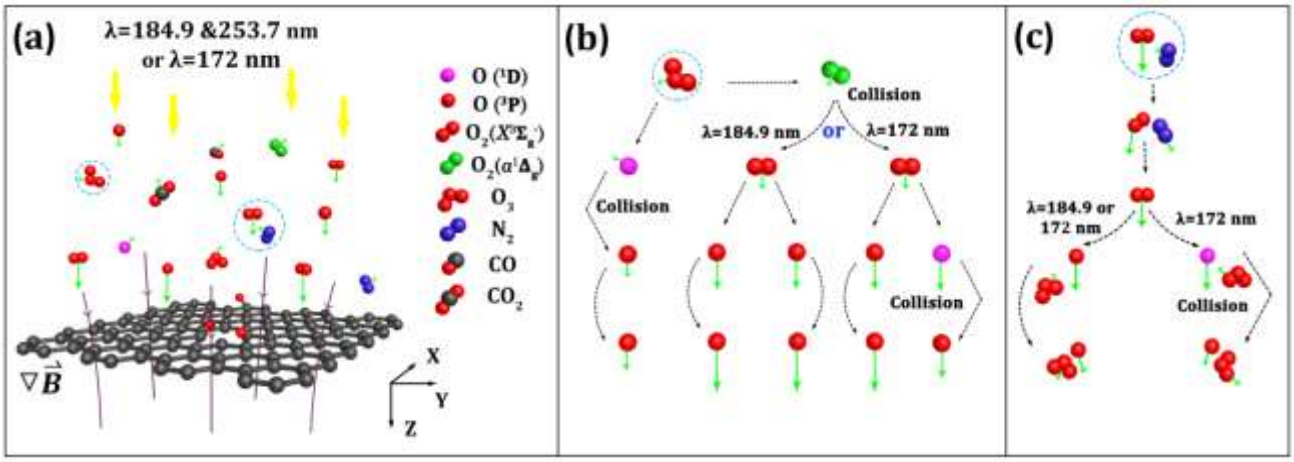


**Figure 1**: Dynamic photochemical reaction in the magnetic-assisted UV photochemical oxidation ($B_Z$=0.31 T, $\nabla B_Z$=90 T·m$^{-1}$) under irradiation of the ultraviolet lamp. (a) Dynamic motion of various molecules with green arrows denoting the velocity. (b) Photodissociation of ozone and oxygen molecule under different UV excitations in the magnetic field. (c) Collisions between the oxygen molecule/atoms and the diamagnetic molecules. The diamagnetic singlet oxygen molecule $(\alpha^1\Delta_g)$ and atom (O($^1$D) deactivate individually to their ground states via collisions.