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Improved synthesis of chemically derived graphene using a thermal processing step PRIYANK KUMAR, NEELKANTH BARDHAN, ANGELA BELCHER, JEFFREY GROSSMAN, Massachusetts Institute of Technology — The excellent physical and electronic properties of graphene have fueled the exploration of novel methods for its large-scale production and solution-processability. To this end, thermal or chemical reduction of graphene oxide (GO) represents a promising step. However, the problem of incomplete reduction and the presence of residual oxygen in reduced GO (rGO) sheets continue to persist in current reduction protocols. Here, we present a thermal processing step that improves the reduction efficiency of GO sheets, and results in superior sheet properties of chemically derived graphene. For instance, upon using the additional thermal processing step, the electronic conductivity increased by a factor of 6-8 in the reduced GO samples. Using atomistic calculations, we provide detailed insights into the physical mechanisms resulting in improved reduction. Overall, we show that our processing step can be easily integrated into current thermal and chemical reduction protocols, and could be crucial toward producing large-scale, high quality graphene.

Priyank Kumar
Massachusetts Inst of Tech-MIT

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