

# Continuous gas-phase plasma process to produce few-layer crumpled graphene

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Abstract : Raymor is industrializing a continuous gas-phase plasma process to produce few-layer crumpled graphene sheets at commercial scale (few hundred grams per hour) using a 60 kW plasma torch. Process optimization has allowed us to produce a material having an outstanding high crystallinity and purity.

Raymor's patent protected plasma production process is continuous, robust, and low-cost compared to other manufacturing methods. The material presents low oxygen content (1-2%) and ppm metal impurity levels, suitable for battery applications.

The turbostratic layering and 'crinkled' 3-D morphology of this graphene is unique, and provides superior dispersability in a variety of solvents. Efforts toward process stability, product quality and product standardization will be reviewed. Characterization of the material is routinely done using Raman spectroscopy and nitrogen adsorption isotherm (surface area): plasma-grown graphene presents a G/D ratio up to 4 at 514 nm excitation wavelength along with a surface area greater than 400 m<sup>2</sup>/g. Advantages of utilizing this material in energy storage and conductive ink applications will be discussed.