Synthesis of uniform monolayer graphene on copper from waste chicken fat by low pressure chemical vapor deposition

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Solid waste management has been a concern for humans since the beginning of time [1, 2]. In this report, we revealed the transformation of solid waste chicken fat into uniform monolayer graphene film on re-solidified Cu substrate by a low pressure chemical vapor deposition (LPCVD) technique. The evolve gas analyzer-gas chromatography-mass spectrometry (EGA-GC-MS) analysis of chicken fat oil showed that the free fatty acid in chicken oil decomposed into a short hydrocarbon chains which makes it favorable to be used as a carbon precursor for the graphene synthesis. The re-solidification process of Cu by high temperature annealing results in big grains of Cu (111) facet with very smooth surface.

Growth of uniform monolayer graphene film on the re-solidified Cu was confirmed by Raman mapping, where 2D to G peak intensity ratio (I₂D/IG) is 3.0 at most of the area. Scanning electron microscopy (SEM) and atomic force microscopy (AFM) revealed less wrinkles in the as-synthesized monolayer graphene on smoother Cu surface, enabling the fabrication of transparent electrode with low sheet resistance. Thus, the use of waste from poultry industry as a carbon source instead of commonly used explosive hydrocarbon gas sources for graphene synthesis is not only reducing the pollution, it is undoubtedly an encouraging step to convert waste to a valuable product.

References: