Biogenic and Non-biogenic Waste Utilization in the Synthesis of 2D Materials (Graphene, h-BN, g-C_2N) and their Applications

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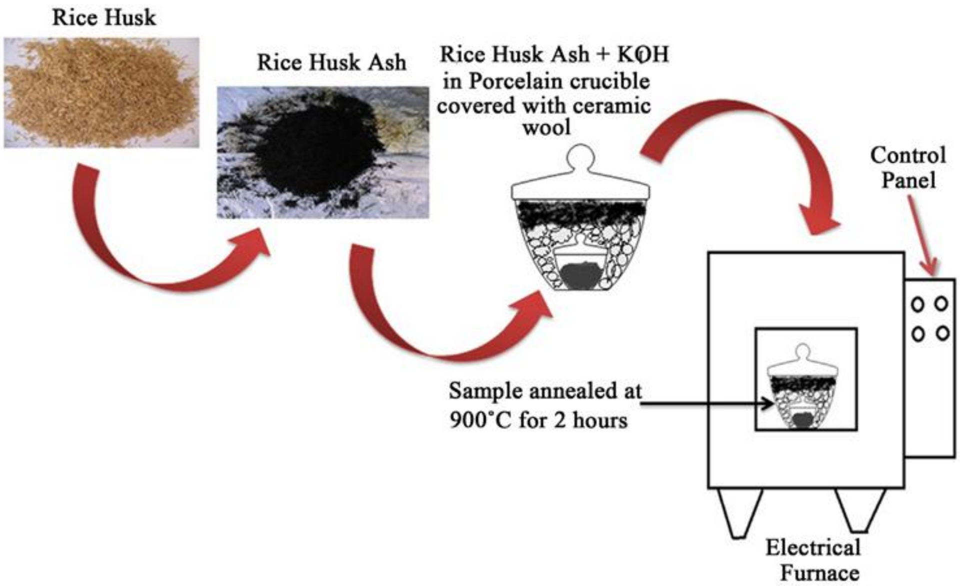

Figure S1: Experimental set-up for synthesis of rice husk ash derived graphene (Singh et al., 2017).

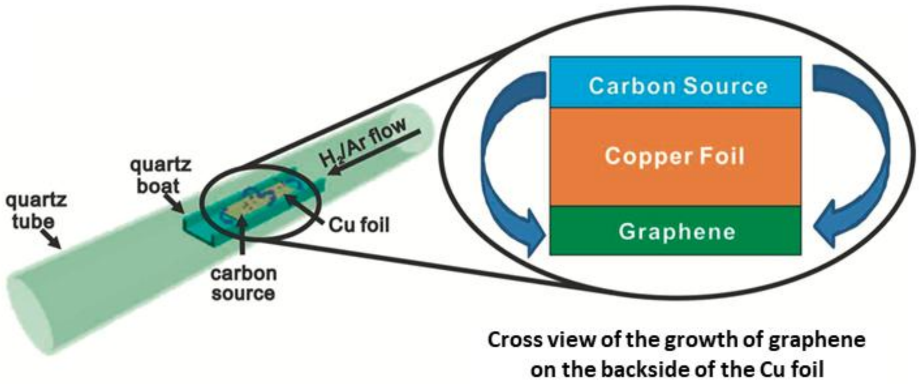

Figure S2: Diagram of the experimental apparatus for the growth of graphene from food in a tube furnace. On the left, the Cu foil with the carbon source contained in a quartz boat is placed at the hot zone of a tube furnace. The growth is performed at 1050 ºC under low pressure with a H_2/Ar gas flow. On the right is a cross view that represents the formation of pristine graphene on the backside of the Cu substrate.The figure is reprinted with permission from Raun et al., 2011, Copyright 2011, American Chemical Society

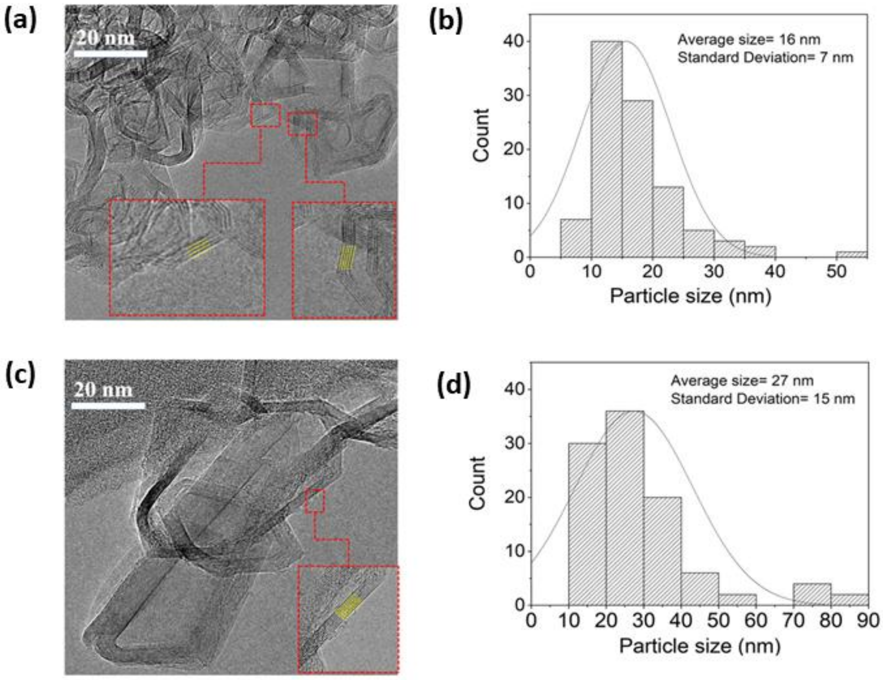

Figure S3:(a) TEM image of AC turbostartic flash graphene (AC-tFG) from high density polyethylene (HDPE) and (b) particle count of AC-FG (n = 100). (c) TEM image of sequential AC and DC tFG from HDPE and (d) particle count of ACDC-tFG from HDPE (n = 100). The figure is reprinted with permission from Algogeeb et al., 2020, Copyright 2020, American Chemical Society

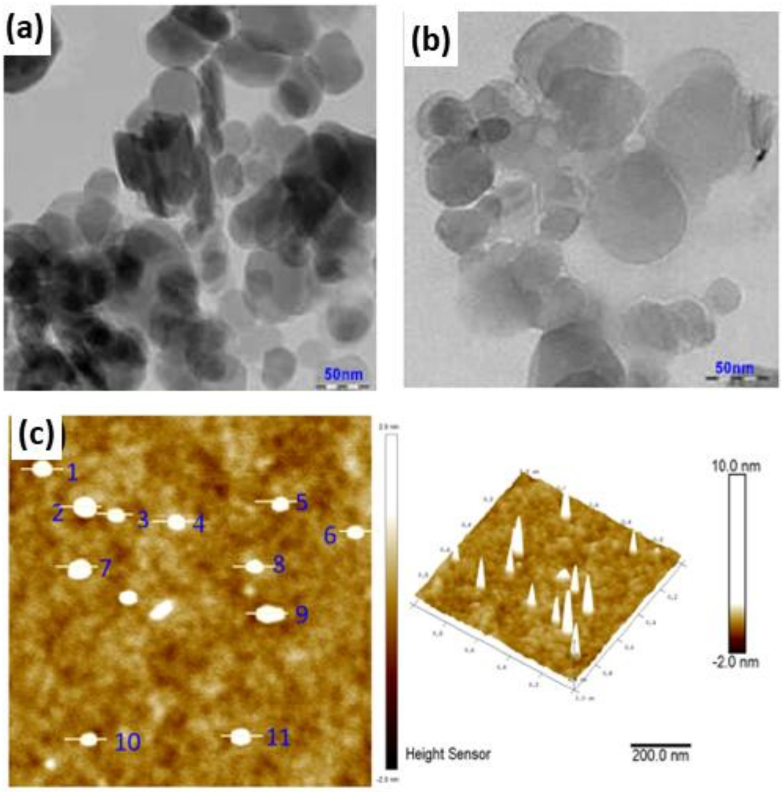

Figure S4:TEM micrographs for (a) pristine h-BN (b) h-BN nano sheets biogenically exfoliated using plant extract of MorousNigra (c) AFM topography and three dimensional image of h-BN nano sheets biogenically exfoliated using plant extract of HoveniaDulcis. The figure is reprinted with permission from Deshmukh et al., 2019, Copyright 2019, American Chemical Society

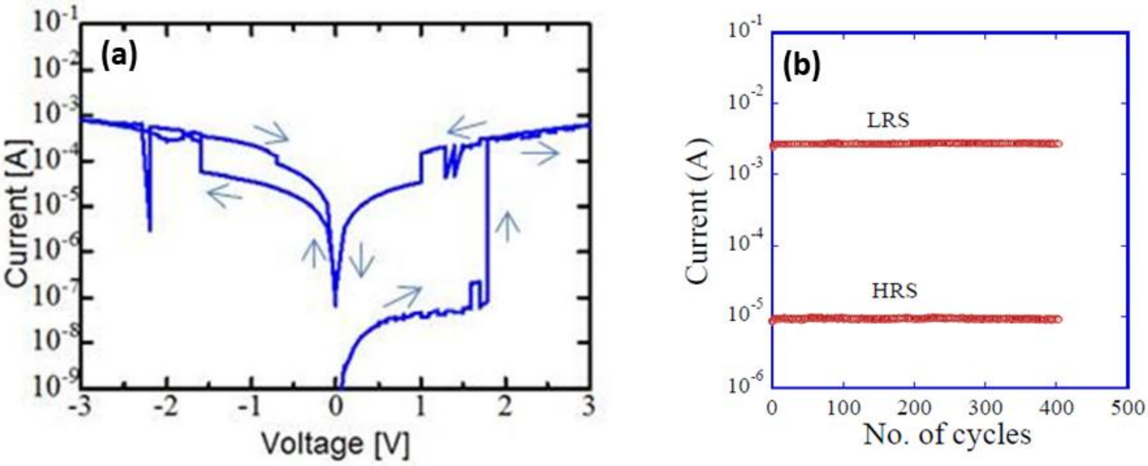

Figure S5: I-V Characteristics (a) and the retention plot showing HRS and LRS over 400 cycles taken over 10 minutes (b) of a memory device. The figure is reprinted with permission from Jacob et al., 2015, Copyright 2015, American Chemical Society

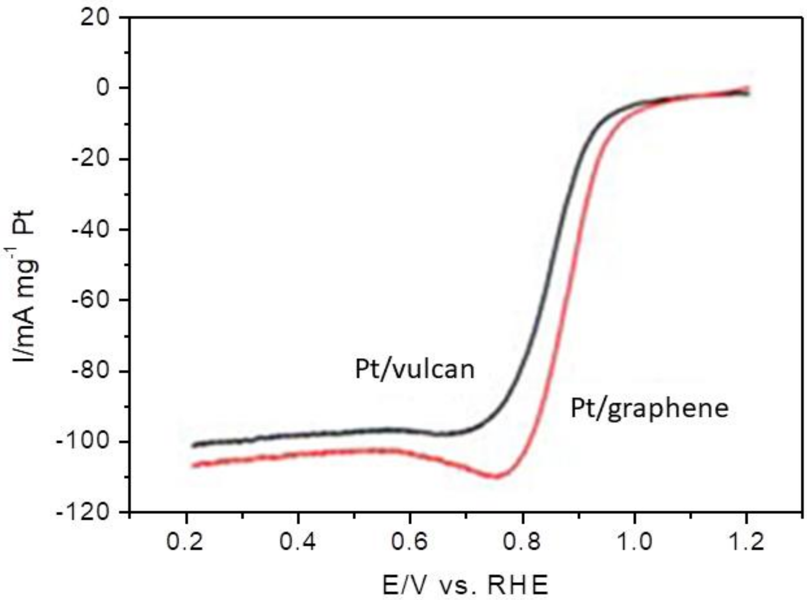

Figure S6: Figure LSV curves recorded in 1.0 M $HClO_4$ solution saturated with oxygen using Pt/graphene sheets and Pt/Vulcan catalyst. The figure is reprinted with permission from Zhao & Zhao, 2013, Copyright 2013, Royal Society of Chemistry

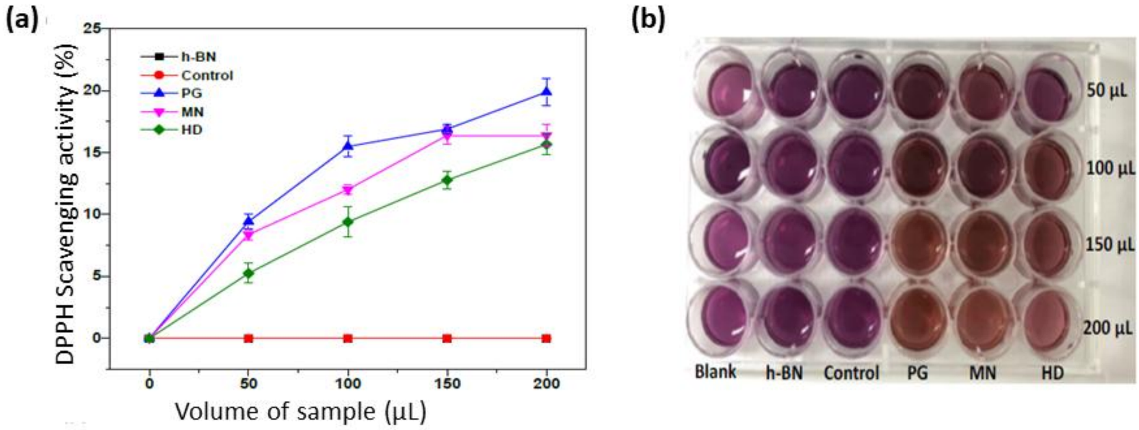

Figure S7: Biogenically exfoliated h-BN nanosheets using plant extract (PG, MN and HD), pristine and control h-BN (a) DPPH free radical scavenging activity (b) Photograph showing antioxidant activity with increasing concentration. The figure is reprinted with permission from Deshmukh et al., 2019, Copyright 2019, American Chemical Society

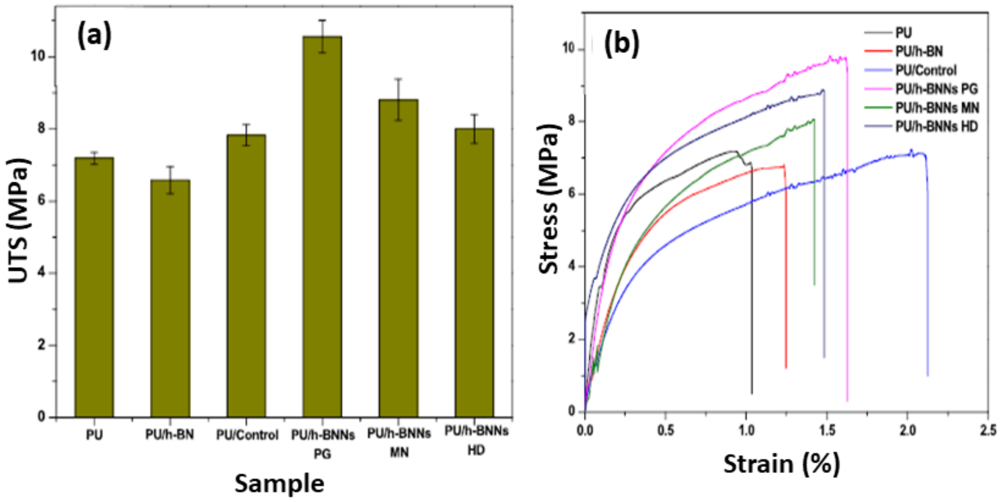

Figure S8: (a) Ultimate tensile strength of pure polyurethane, polyurethane + h-BN, polyurethane + control, and polyurethane + h-BN nano sheets exfoliated biogenicallyfrom plant (PG) extract, (b) representative stress vs strain curve for the same samples. The figure is reprinted with permission from Deshmukh et al., 2019, Copyright 2019, American Chemical Society