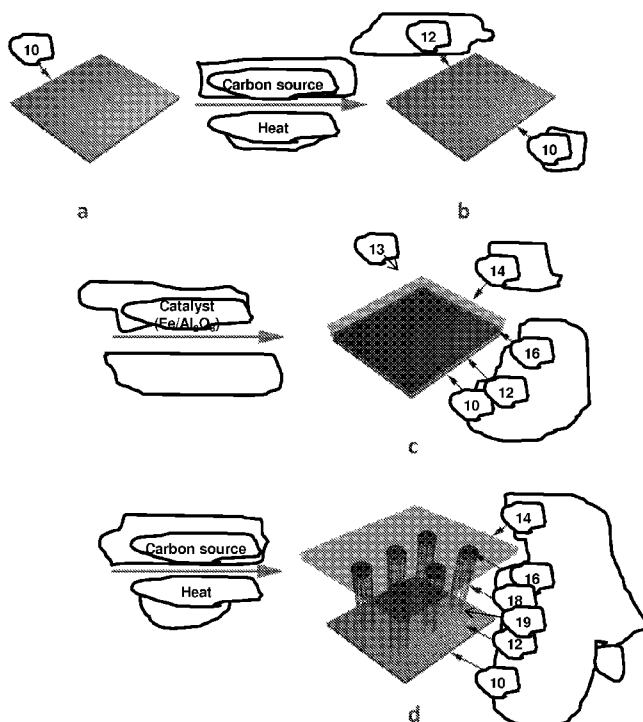




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(54) **Title:** GRAPHENE-CARBON NANOTUBE HYBRID MATERIALS AND USE AS ELECTRODES

(57) **Abstract:** In some embodiments, the present invention provides methods of making graphene- carbon nanotube hybrid materials. In some embodiments, such methods generally include: (1) associating a graphene film with a substrate; (2) applying a catalyst and a carbon source to the graphene film; and (3) growing carbon nanotubes on the graphene film. In some embodiments, the grown carbon nanotubes become covalently linked to the graphene film through carbon-carbon bonds that are located at one or more junctions between the carbon nanotubes and the graphene film. In some embodiments, the grown carbon nanotubes are in ohmic contact with the graphene film through the carbon-carbon bonds at the one or more junctions. In some embodiments, the one or more junctions may include seven-membered carbon rings. Additional embodiments of the present invention pertain to graphene-carbon nanotube hybrid materials that are formed in accordance with the methods of the present invention.



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