Chemical Doping of Graphene Grown Directly on Glass using MW-SWP-CVD for Use as Transparent, Conducting Electrodes

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In particular, graphene is envisaged as an environmentally-friendly and flexible substitute for indium tin oxide (ITO) and Fluorine Doped Tin Oxide (FTO), as the transparent conductor but obtaining low and stable sheet resistances remains challenging. Pristine graphene exhibits high carrier mobility, but its intrinsic carrier density is close to zero, making its conductivity uncompetitive with ITO& FTO [1, 2]. Chemical doping of graphene is a key process for the modulation of its electronic properties and the design and fabrication of graphene-based electronic devices. The effect of chemical n-type & p-type doping on graphene stacks was studied in order to reduce the sheet resistance ($R_{S)}$ of graphene films to values approaching those of conventional transparent conducting oxides. The graphene film synthesized by Microwave Assisted Surface Wave Plasma (MW-SWP-CVD (see Fig. 1) [3]) on to glass substrates. Gold chloride, Copper chloride, Iron chloride, Silver nitrate, Nitric acid and ionic liquids, were used to dope the graphene films and the sheet resistance was reduced by up to 70% depending on the doping material and its concentration. The n-type & p-type doping behavior was confirmed by characterizing the Raman Sparta and Hall Effect measurement of the doped graphene film. Finally, The effect of doping on the Transmittance (T %) was also investigated at the visible wavelength for the doped graphene film onto glass substrates.

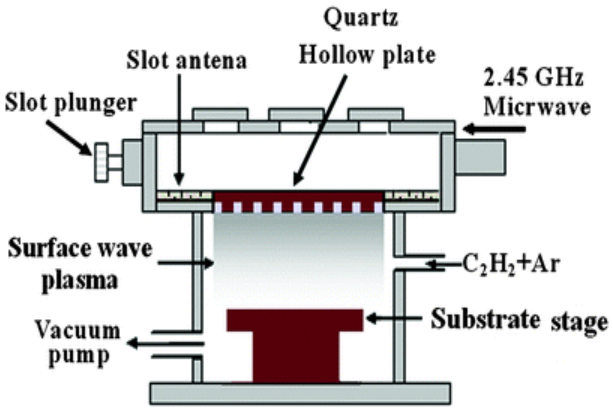

Fig. 1 Schematic diagram of MW-SWP-CVD

References

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