Development of graphene and related materials in TASC and AIST

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Abstract

TASC, which consists of private companies and AIST, is a research organization for the development of nano-carbon materials. Graphene division of TASC develops graphene and related materials for industrial applications. CVD graphene atomic layer membranes of nanometer thickness, multilayer graphene films of micron thickness by high-temperature treatment of polymers, and exfoliated graphene dispersion from graphite and its integrated films are specifically developed.

Graphene Atomic Layer Membrane by Plasma CVD [1, 2, 3]
We have achieved a graphene membrane with a transmittance of 95% (two-layer) for visible light and sheet resistance of 130Ω (gold chloride doped) by developing an original plasma CVD method. In addition, A4- size light transmittance of 92% (3.6 layers) and sheet resistance 500Ω (without doping) have been achieved. The plasma CVD is characterized by high-growth rate graphene atomic membrane compared with conventional thermal CVD, which is suitable for the high-throughput production for the industrial use. A variety of applications using graphene atomic layer membrane have been being developed by utilizing the characteristics such as electrical conductivity, flexibility, transparency, and chemical resistance.

Multi-layer graphene by high-temperature treatment of polymers
By high-temperature treatment at more than 3000°C of polymer thin films we have been developing a synthesis method of multilayer graphene of a thickness of 3μm ~ 100nm. The multi-layer graphene film produced by our method has very high electrical conductivity of 25,000S/cm and thermal conductivity of 2,000W/mK in a planar direction, which are equivalent to single crystal graphite. Along with the synthesis method, we are promoting the development of variety of applications.

Exfoliated graphene dispersion and integrated films by liquid phase process
By exfoliating graphite in the liquid phase we have been developing a synthesis method of high-quality graphene dispersion at a low cost. In order to enable the mass production we have developed an original exfoliation technique which does not use a high-temperature furnace and dangerous chemicals. We have also developed a forming technique of integrated films from graphene dispersion such as self-supporting films without binders, and improved the performance of the films, such as electrical conductivity and so on.

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References

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