Mass Synthesis and Application of Graphene Flower and Graphene-Related Products

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We, in Incubation Alliance, Inc., have been working on the development of a method for mass synthesis of graphene and other graphene-related products as raw materials for industrial uses. We have developed a method using HIP (Hot Isostatic Pressing) for the manufacture of Graphene Flower® with high purity and quality[1]; a method for producing Graphene-coated carbon fiber cloth[2]; an in-house molding method for manufacturing a highly-oriented graphite block, Graphene Flower® BL[3]; a method for producing porous graphene[4] and neutron strengthened graphene material.[5]

In our patented method for producing Graphene Flower® using HIP, it is possible to produce a bulk material in which high-purity few-layer graphene is three-dimensionally densely grown without using any substrate and catalyst. It is also possible to control the number of graphene layers and the dimension or size of our graphene. Using the same technology, graphene-coated carbon fibers having several layers of graphene densely grown on all surfaces of woven and non-woven carbon fibers are produced. This can be used as materials of electrodes for field emission, biofuel cells, supercapacitors and fuel cells, for both research and development purposes.

Graphene Flower® BL, which is a highly oriented graphite block of 100% carbon that utilizes the Van der Waals force of graphene as a binder. It has high thermal conductivity, electrical conductivity and sliding properties. Using our in-house developed molding technology, it is possible to manufacture blocks with a thickness of 100 mm or more. And by multi-wire slicing, sliced graphene parts with arbitrary thickness of 0.2 mm or more can be practically used as heat dissipation and heat transfer materials for IT equipment, medical equipment, next-generation energy furnaces and others.

Recently, by optimizing the dimension and shape of graphene flowers and graphene seeds, we have demonstrated the coherent scattering of neutrons by graphene for the first time in the world. [5] In this presentation, we will introduce these graphene and graphene-related products and their practical applications.

References

[1] K. Muramatsu, U.S. Patent 8951451B2, May 25,2010
[2] K. Muramatsu, Graphene2015 International Conference, Bilbao, Spain, 2016.3.10-13
[3] K. Muramatsu, U.S. Patent 11339055 B2, May 24,2022
[4] K. Muramatsu, Patent pending, PCT/JP2022/024712
[5] M. Teshigawara, et al, Nanomaterials 2023, 13(1), 76

Figures

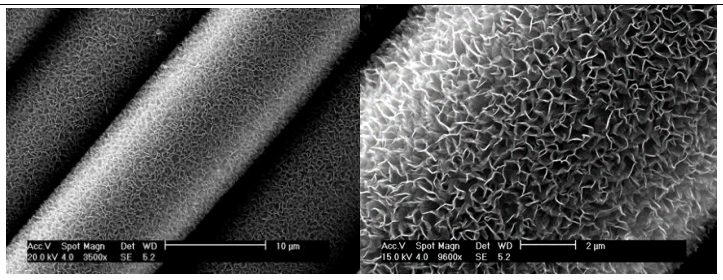

Figure 1: Graphene coated carbon fiber(SEM)

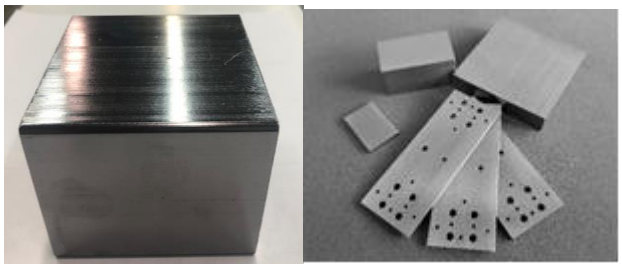

Figure 2: Graphene heat dissipation products