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Characteristics of thin graphene sheets prepared by a laser ablation method MAKI NAKAMURA, National Institute of Advanced Industrial Science and Technology (AIST), TAKAZUMI KAWAI, NEC Corporation, MICHIKO IRIE, AIST, RYOTA YUGE, NEC Corporation, SUMIO IIJIMA, SHUNJI BANDOW, Meijo University, MASAKO YUDASAKA, AIST — Graphenes are innovative carbon materials having a sheet-like structure; these materials are thought to have many applications in the fields of electrochemistry, biomedicine, and so on. In this study, we showed that thin graphene sheets (TGSs) prepared by a laser ablation method had a distinctive structure: even-number layered graphenes (2-, 4-, 6- and 8-layers) were preferentially grown (ca. 90%), and their population decreased as the layer number increased. These phenomena have not been observed in graphenes prepared with other methods. Our results suggest a new growth mechanism in which single-layer graphene is unstable and bends to form bi-layers, and the bi-layers then go on to stack and form thicker TGSs. The inter-layer distances estimated by transmission electron microscope images were about 15% larger than that of bulk graphite in the bi-layer TGSs, and they approached the bulk value as the layer number increased. Furthermore, we showed surface-selective functionalization of TGSs by mild oxidation with H_2O_2 at room temperature, indicating the possibility of multi-modal functionalization, which will make the graphene more attractive in various applications.

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