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支援課題名 (日本語) : プローブ顕微鏡による表面科学計測、ナノカーボン創製と応用の支援
Program Title (in English) : Scanning Tunneling Microscopy observation of graphene grown on vicinal SiC surfaces
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概要 (Summary) :

We study graphene and graphene nanostructures, such as graphene nanoribbons (GNR) growth on vicinal SiC surfaces. Vicinal surfaces, consisting of array of terraces and facets, provide unique periodic template for selective growth of nanostructure. Utilizing such new technique of material growth requires knowledge of what actually happens on the surface and precise quality control, which can be achieved only by such local analysis technique such as scanning tunneling microscopy (STM).

実験 (Experimental) :

To achieve our goals we used commercial variable temperature (VT) STM machine by Omicron NanoTechnology GmbH installed in laboratory of Prof. M. Yoshimura. Pre-prepared samples of SiC(0001) with grown GNRs, as well as clean SiC(0001) (for Si cleaning experiments) were introduced in the vacuum chamber and cleaned by resistive heating. STM images have been taken in constant current mode using chemically etched tungsten tips.

結果と考察 (Results and Discussion) :

Growth of epitaxial graphene on SiC requires high-quality initial surface. Up to now we used H₂ etching to clean the surface; however, the final quality of the samples was doubtful in terms of nanoscale atomic structure. We developing new method such as *in situ* Si flux cleaning. Our STM results show that indeed this method is highly

advantageous and results in clean surface with well-defined low-defect atomic structure and absence of surface contaminations.

STM observations of pre-prepared GNR samples show that nanoribbons are indeed formed on the terraces of vicinal surface. The existence of standing-wave-like electronic interference pattern indicates that the GNR edges are predominantly armchair type. However, very high amount of defects and surface contaminations making STM observation highly difficult and overall quality of GNRs are not quite satisfactory.

Further experiments and fine-tuning of preparation methods are required to achieve our goals of preparing high-quality GNRs on SiC vicinal surfaces.

その他・特記事項 (Others) : なし

論文・学会発表 (Publication/Presentation) :

日本物理学会 第68回年次大会 広島大学 (3月26日～29日) A.Visikovskiy, Y.Kurisu, T.Kajiwara, S.Tanaka, M.Yoshimura, F. Komori “Growth of graphene nanoribbons on vicinal SiC(0001) studied by STM”