



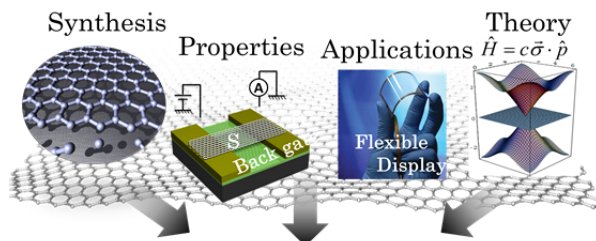
**Title of Project : Science of Atomic Layers**

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**【Purpose of the Research Project】**

The purpose of the present research project is to establish an interdisciplinary community for investigating atomic layer materials such as graphene and hexagonal boron nitride (h-BN). Graphene, an atomic layer of the hexagonal lattice of carbon, has stimulated the interests of many researchers in the past decade because of its significant physical properties in electronic transport and optical properties. Recently many scientific projects on graphene have started in many countries in the world or European Union. Thus it is an urgent task to establish a community in Japan for the science of atomic layers, particularly graphene.

**Investigation of single atomic layer materials**



Opening up science of atomic layer materials  
Creation of novel principles and industries

Our goals for the project consist of (1) establishing high quality atomic layer samples of graphene etc, (2) investigating new exotic properties of atomic layers, (3) fabricating electronic devices made of atomic layer systems, and (4) establishing a theoretical framework on atomic layer systems.

**【Content of the Research Project】**

Our projects consist of 4 sub-groups, A01, A02, A03, and A04 which respectively correspond to our four goals stated above. Here we show more specific goals of each sub-group.

- (1) A01 Synthesis: This group will establish a new method for making hybrid systems consisting of different atomic layers. Depending on the demands of other

sub-groups, they will produce different types of graphene and h-BN samples in size and quality.

- (2) A02 Properties: This group will establish the process and control of the samples and investigate the properties of the solid. In particular, new exotic properties of massless Dirac electrons in graphene will be investigated.
- (3) A03 Applications: This group will connect the science of atomic layers to the engineering of manufacturing electronic devices. In particular, combining graphene and h-BN atomic layers heterostructure, they will make high performance devices.
- (4) A04 Theory: This group will establish a theoretical framework of graphene and atomic layer materials, while supporting the experimental groups.

**【Expected Research Achievements and Scientific Significance】**

- (1) By connecting different fields of science and engineering, we expect a strong team for the science of atomic layers.
- (2) In particular, new collaboration within the team is expected which can induce the breakthrough of technology which generates new industry.
- (3) We can compete with other countries by making a nice scientific team in Japan.

**【Key Words】**

Graphene, h-BN, MoS<sub>2</sub>, atomic layer, synthesis, electronic devices

**【Term of Project】** FY2013-2017

**【Budget Allocation】** 1,048,700 Thousand Yen

**【Homepage Address and Other Contact Information】**

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