Name	Job Title	Area of Expertise
OHSHIMA Tamiko	Professor	Plasma Materials Science

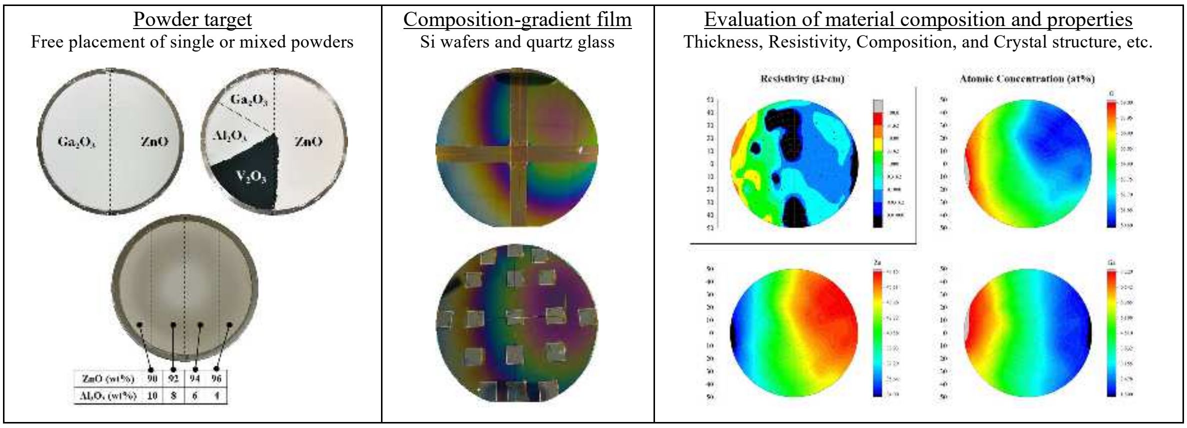
1. Main Research Topics

① Rapid and cost-effective material exploration using the powder sputtering method

In this approach, functional thin films are fabricated by directly using powder as the sputtering target material. Compared to conventional solid targets, powder targets offer several advantages:

- **Reduced target fabrication time**: By mixing powders, elemental combinations and composition ratios can be freely and widely adjusted. Moreover, since sintering is not required, targets composed of low-melting-point or multi-element materials can be fabricated in a short time.
- **Cost reduction**: For targets of the same size, powder targets can reduce costs by up to approximately 1/1000* compared to solid targets (*depending on the type of powder).

Additionally, powder targets are highly compatible with combinatorial thin film deposition. The spatial arrangement of powders within the target holder can be freely modified, allowing multiple powder types to be configured within a single cathode. This eliminates the need for large-scale equipment—only one cathode and power supply are required—and enables the fabrication of numerous composition-gradient films in a single deposition process. As a result, correlations between material composition and physical properties can be efficiently evaluated. By leveraging these benefits, we aim to establish methods for the rapid and cost-effective exploration and development of new and alternative materials.



② Fabrication of High-Quality Carbon Nanostructures via Multi-Hollow Plasma CVD Method

We are synthesizing carbon nanoparticles (CNPs) using the multi-hollow plasma chemical vapor deposition (MHPCVD) method. This technique has previously demonstrated success in controlling the crystallinity, particle size, and deposition amount of silicon nanoparticles, and the key parameters influencing these controls have been identified. The objective of this study is to clarify the factors that control the crystallinity, particle size, and deposition amount of CNPs. In particular, crystalline CNPs are expected to enhance the performance of lithium-ion batteries. Therefore, we aim to clarify the structural control factors of CNPs through process optimization using the MHPCVD method.

2. Keywords

Sputtering, Powder Target, Combinatorial, Thin Film, Carbon Nano Particles

3. Remarks and Websites

My laboratory has conducted collaborative research on the exploration of electronic component materials. While solid targets are typically used for mass production, fabricating a new solid target each time the elemental composition or ratio is changed during the material exploration phase is both time-consuming and costly, often resulting in low target utilization efficiency. In this study, we aim to accelerate and reduce the cost of material exploration by directly using powder as the sputtering target. Once sufficient information is obtained, the solid target for mass production can be fabricated, thereby contributing to the shortening of the overall development timeline.

researchmap: https://researchmap.jp/tamiko_ohshima
Laboratory: https://plasma.eee.nagasaki-u.ac.jp