

Abstract Submitted
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Production of Nano-composite Si-M powders by plasma spraying for next generation lithium ion batteries¹ MAKOTO KAMBARA, NAREN GERILE, MASHIRO KAGA, TASUKU HIDESHIMA, Dept. Mater. Eng., The University of Tokyo, DEPT. MATER. ENG., THE UNIVERSITY OF TOKYO TEAM — We have attempted plasma spraying to produce nano Si powders for lithium ion batteries at the industrial compatible throughputs. Several 100 nm nano-composite powders are typically produced from metallurgical grade Si powders, and its improved battery capacity has been revealed. When doped with >10 mol%Ni, several SiNix alloy particles, that are the congruent phases with relatively high melting temperature in the Si-Ni binary system, were produced. The battery performance of these powders was not as good as that with Si powders only. In contrast, at 5 mol%Ni addition, NiSi₂ phase was only detected apart from Si. Importantly, the battery performance was improved. Since NiSi₂ is an incongruent phase that forms through peritectic reaction, it plausibly nucleates heterogeneously on surface of Si particles that nucleate in advance. In fact, TEM analysis revealed that NiSi₂ was present on Si surface not as individual particles. Therefore, such a composite structure, not a simple mixture of foreign particles, is considered to improve the battery performance possibly by increasing the particle mechanical integrity as well as the electric conductivity of the electrode.

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Makoto Kambara
Dept. Mater. Eng., The University of Tokyo

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