# Fabrication of Novel Nano-hollow Sphere Metals and Metallic Nano-tube and Elucidation of Physical Properties

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**【Outline of survey】**

Effective utilization of gas pores such as solidification defects had not been paid attention well. However, recently Nakajima et al. has been investigating to fabricate lotus-type porous metals and alloys through unidirectional solidification of the melt metal dissolving gas. The pores are evolved by the gas solubility gap between solid and liquid phases. Significant anisotropy of the physical properties is exhibited by the directional pore morphology. Investigations for various applications of the lotus metals are now in progress to golf head, heat sink, airplane engine and machinery body.

Nano-sized pores are expected to affect various physical and functional properties because the pore size is as large as the electron mean-free-path or coherence length of superconductor. Under such motivation, the present investigation is planned:
(1)to fabricate nano porous metals such as nano-hollow sphere and nano-tube
(2)to find and elucidate novel mechanical, electromagnetic and thermal properties.

**【Expected results】**

Nano porous metals such as nano-hollow sphere and nano-tube will be synthesized by the technique utilizing the Kirkendall effect under the driving forces. Such nano-sized pores may interact with dislocation motion, scattering of electrons and phonons, etc. Thus, novel mechanical and physical properties are expected to be observed in the nano porous materials which are prospected to be applied to nano-machine, molecular filter and nano-electronics devices. Besides, we expect to develop novel porous materials science.

**【References by the principal researcher】**

(1) Fabrication of lotus-type porous iron and its mechanical properties,S.K.Hyun, T.Ikeda and H.Nakajima, Sci.Tech.Adv.Mater., **5**,201-205(2004).
(2) Fabrication of lotus-type porous stainless steel by continuous zone melting technique and mechanical property, T.Ikeda, T.Aoki and H.Nakajima, Metall.Mater.Trans.A, **36A**,77-86(2005).

**【Term of project】** FY 2005 - 2009 | **【Budget allocation】** 85,200,000 yen

**【Homepage address】** http://www.sanken.osaka-u.ac.jp/labs/mmp/