

**Preparation and Characterization of New Exotic Superconductors
Having Porous Networks**

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【Outline of survey】

Most of recently developed superconductors have layered or cage-like structures, and can be classified into “porous superconductors”. In this project, we will focus on such porous covalent network systems to develop new superconductors on the basis of our studies made so far on silicon clathrate and layer structured nitride compounds. It is true that most superconductors have been found by chance. In this project, we will make a systematic approach to develop new superconductors by the carrier doping via intercalation, high-pressure synthesis, and thin-film deposition. The resulting compounds will include “exotic superconductors” which seem to be non-superconducting at a glance. The superconducting mechanisms of the newly developed compounds will be studied in close collaboration with physicists on superconducting tunnel spectroscopy and solid state NMR spectroscopy.

【Expected results】

1. Development of new cage-like and layer structured superconductors
2. Electron doping by intercalation to develop new superconductors.
3. Development of new superconductors using high pressure synthesis.
4. Characterization of newly developed superconductors by the measurements of the superconducting gap and NMR.
5. Preparation of new superconducting nitride thin films.

【References by the principal investigator】

- S. Yamanaka, S. Maekawa, Structural Evolution of the Binary System Ba-Si Treated under High-Pressure and High-Temperature Conditions, *Z. Naturforsch.* **61b**, 1-7 (2006).
- S. Yamanaka, A. Kubo et al, Electron conductive three-dimensional polymer of cuboidal C₆₀, *Phys Rev Lett* **96**, 76602/1-4 (2006).

【Term of project】 FY2007—2009

【Budget allocation】 32,000,000 yen
(2007 direct cost)

【Homepage address】 Under construction