

Superconductivity in an Alkali Doped Polycyclic Aromatic Hydrocarbon, Picene

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The effect of carrier doping into polycyclic aromatic hydrocarbons, including perylene and pentacene, has been extensively studied.[1] As a result of halogen or alkali metal doping, a drastic increase in electrical conductivity was observed. However, superconductivity has not been reported except the one by Schön *et al.*[2] Recently, Kubozono reported that one of them, i.e. picene (Fig.1) showed superconductivity at 20 K by doping with potassium.[3] We anticipate that other aromatic hydrocarbons can also be made superconducting in a similar way, which will lead to surprising findings of hidden organic molecular superconductors.

In this presentation, we will report on the characterization of superconducting properties of alkali doped picene. (Picene is commercially available from NARD institute, Ltd.) Instead of ordinary vapor phase alkali metal doping, we employ thermal decomposition of alkali azides, i.e. AN₃ where A = Na, K, Rb, Cs. We followed the doping procedure of thermal decomposition applied to fullerene C₆₀. [4] A systematic variation of the superconducting transition temperature and fraction are studied as a function of alkali metal composition.

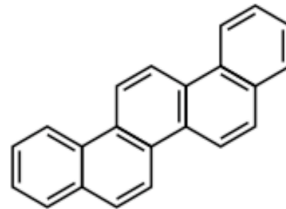


Figure 1: Picene

- [1] H. Akamatsu, H. Inokuchi, and Y. Matsunaga, *Nature* 173 (1954) 168.
- [2] J. H. Schön, Ch. Kloc & B. Batlogg, *Nature* 406 (2000) 702; retraction, *Nature* 422 (2003) 93.
- [3] R. Mitsunashi, Y. Kubozono, N. Kawasaki, T. Kambe, N. Ikeda, H. Okamoto, Y. Yamanari, Y. Suzuki, A. Fujiwara, Y. Maniwa: Superconductivity of alkaline doped aromatic hydrocarbon, 64th Annual Mtg. of the Physical Society of Japan (Tokyo, March 29, 2009) 29pYG-6; Abstract Vol.64, Issue 1, Part 4, p.847.
- [4] M. Tokumoto, Y. Tanaka, N. Kinoshita, T. Kinoshita, S. Ishibashi and H. Ihara: Characterization of Superconducting Alkali and Alkaline-Earth Fullerides Prepared by Thermal Decomposition of Azides, *J. Phys. Chem. Solids*, 54 (1993) 1667.