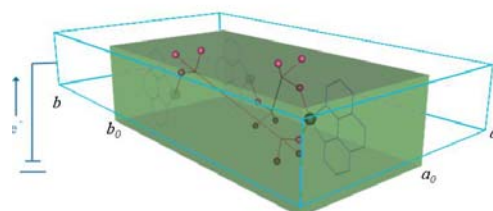


## Towards Electrochemical Artificial Muscles: A Supramolecular Machine Based on One-Dimensional Copper-Containing Organophosphonate System

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The development of artificial system is a field which is currently being intensively explored<sup>[1]</sup>. In particular, interest is being focused on transition-metal-containing system<sup>[2]</sup>. In our laboratory, we have created a new supramolecular machine<sup>[3]</sup>, exhibited reversible electromechanical actuators based on sheets of water-soluble one-dimensional copper-centred ethylenephosphonate (1DOP-Cu) chains, described for the first time. Like natural muscles, the macroscopic sheet actuators are composed of mats of individual nanofiber bundles joined by mechanical entanglement and pi-pi interaction forces along the crystallographic a-axis. The lithium inserted state, upon electrochemical charge injection into 1DOP-Cu, exhibits a reversible contraction/ stretched process by oxidizing or reducing the copper center to Cu(II) or Cu(I) whose coordinated geometries will be changed at will by a redox process, as characterized by x-ray diffraction patterns, solid state NMR, and XANE spectra.



### References:

- [1] G. Gu, M. Schmid, P. W. Chiu, A. Minett, J. Fraysse, G. T. Kim, S. Roth, M. Kozlov, E. Muñoz, R. H. Baughman, *Nature materials* 2003, **2**, 316-319, V<sub>2</sub>O<sub>5</sub> nanofibre sheet actuators
- [2] S. J. Fu, C. Y. Cheng, W. H. Chen, K. J. Lin, H. M. Kao, *Angew. Chem. Int. Ed.*, 2004, **43**, 4186, Towards Electrochemical Artificial Muscles: A Supramolecular Machine Based on a One-Dimensional Copper-Containing Organophosphonate System
- [3] J.-P. COLLIN, C. DIETRICH-BUCHECKER, P. GAVIÑA, M. C. JIMENEZ-MOLERO, J.-P. SAUVAGE, *Acc. Chem. Res.* **2001**, **34**, 477-487, Shuttles and Muscles: Linear Molecular Machines Based on Transition Metals