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Metallic Glass Wire Based Localization of Kinesin/Microtubule Bio-molecular Motility System K. KIM, A. SIKORA, S. YAGINUMA, K.S. NAKAYAMA, WPI-AIMR, Tohoku University, Japan, H. NAKAZAWA, Biomolecular Engineering, Graduate School of Engineering, Tohoku University, Japan, M. UMETSU, WPI-AIMR/Biomolecular Engineering, Graduate School of Engineering, Tohoku University, Japan, W. HWANG, Biomedical Engineering/Materials Science and Engineering, Texas A&M University; School of Computational Sciences, KIAS, Korea, W. TEIZER, WPI-AIMR, Tohoku University, Japan; Physics and Astronomy/Materials Science and Engineering, Texas A&M University — We report electrophoretic accumulation of microtubules along metallic glass ($Pd_{42.5}Cu_{30}Ni_{7.5}P_{20}$) wires free-standing in solution. Microtubules are dynamic cytoskeletal filaments. Kinesin is a cytoskeletal motor protein. Functions of these bio-molecules are central to various dynamic cellular processes. Functional artificial organization of biomolecules is a prerequisite for transferring their native functions into device applications. Fluorescence microscopy at the individual-microtubule level reveals microtubules aligning along the wire axis during the electrophoretic migration. Casein-treated electrodes are effective for releasing trapped microtubules upon removal of the external field. Furthermore, we demonstrate gliding motion of microtubules on kinesin-treated metallic glass wires. The reversible manner in the local adsorption of microtubules, the flexibility of wire electrodes, and the compatibility between the wire electrode and the bio-molecules are beneficial for spatio-temporal manipulation of the motility machinery in 3 dimensions.

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