Electronic Supporting Information (ESI)

Ultrasound-propelled nanowire motors enhance asparaginase enzymatic activity against cancer cells

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Supporting videos

SI Video 1. Efficient ultrasound propulsion of a large population of asparaginase-modified motors.

Figures

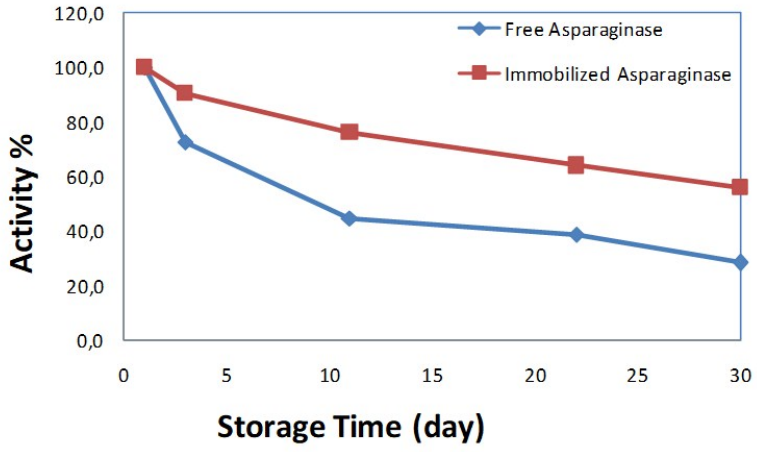

Fig. S1. Prolonged storage stability of asparaginase-modified Au/Ni/Au/PPy-COOH nanowire motors as compared with free enzyme.

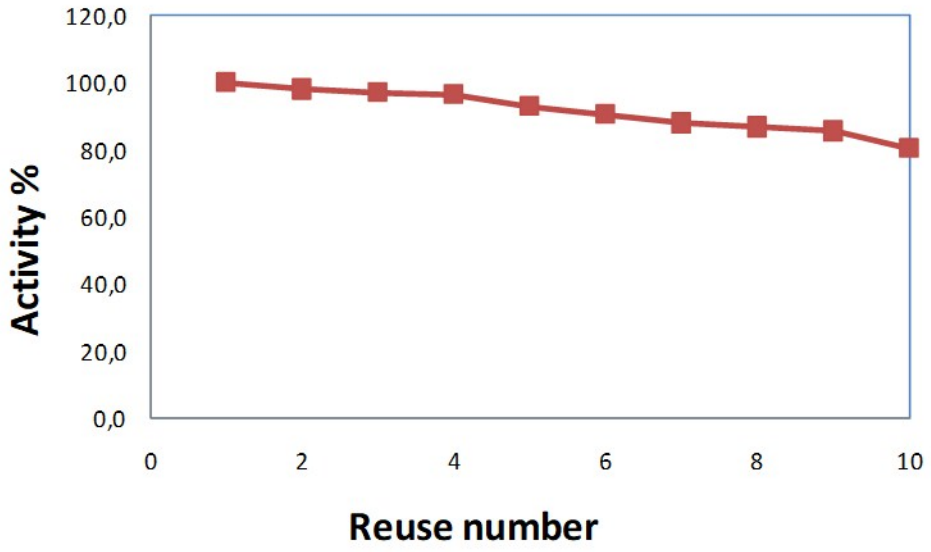

Fig. S2. Reusability profile of asparaginase-modified Au/Ni/Au/PPy-COOH nanowire motors.

Cancer cell inhibition studies

Cancer cell growth inhibition was conducted by [3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium inner salt; MTS] Cell Proliferation Assay (CellTiter 96® AQueous One Solution Cell Proliferation Assay). The method is based on the reduction of MTS tetrazolium compound by viable cells to generate a coloured formazan product that is soluble in cell culture media. This conversion is thought to be carried out by NAD(P)H-dependent dehydrogenase enzymes in metabolically active cells. The formazan dye produced by viable cells can be quantified by measuring the absorbance at 490-500 nm. The extension of cell death/growth inhibition was estimated by the decrease in MTS absorbance. Cells were harvested at 80% confluency and plated in 96-well plates at 1000 cells per well in 100 µL of media per well. To check the efficiency of US-driven asparaginase-immobilized Au-Ni-Au-PPy, US-driven Au-Ni-Au-PPy nanowires, free enzyme and its static counterparts, cell solutions were taken into separate US holders in 25 µL aqueous solutions containing 5.75 x 10^4 motors/mL. Cells without asparaginase or micromotors were included in each experiment as controls. Each reaction mixture -except static conditions- was subjected to an US amplitude of 5 V, and frequency of 2.83 MHz for 30 min. Cells were removed from the US holder and after 24 h incubation, 20 µL of CellTiter 96® Aqueous were added to MTS solution reagent. The conversion of MTS into formazan by metabolically active cells indicated the extent of cell viability. After 1 h incubation at 37 °C in a humidified, 5% CO_2 atmosphere, the absorbance was measured at 490 nm using a microplate reader (Biotek Synergy MX, Mandel Scientific Inc.) for the quantification of cell viability.