Adler-Abramovich, L., Marco, P., Arnon, Z.A., Creasey, Michaels, T.C.T., Levin, A., Scurr, D.J., Roberts C.J., Knowles, T. P. J., Tendler, S.J.B. Gazit, E. Controlling the Physical Dimensions of Peptide Nanotube by Supramolecular Polymer Co-assembly. ***ACS Nano***. 2016, *in press.*

Abstract: Molecular self-assembly of peptides into ordered nanotubes is highly important for various technological applications. Very short peptide building blocks, as short as dipeptides, can form assemblies with unique mechanical, optical, piezoelectric, and semiconductive properties. Yet, the control over nanotube length in solution has remained challenging, due to the inherent sequential self-assembly mechanism. Here, in line with polymer chemistry paradigms, we applied a supramolecular polymer coassembly methodology to modulate peptide nanotube elongation. Utilizing this approach, we achieved a narrow, controllable nanotube length distribution by adjusting the molecular ratio of the diphenylalanine assembly unit and its end-capped analogue. Kinetic analysis suggested a slower coassembly organization process as compared to the self-assembly dynamics of each of the building blocks separately. This is consistent with a hierarchal arrangement of the peptide moieties within the coassemblies. Mass spectrometry analysis demonstrated the bimolecular composition of the coassembled nanostructures. Moreover, the peptide nanotubes' length distribution, as determined by electron microscopy, was shown to fit a fragmentation kinetics model. Our results reveal a simple and efficient mechanism for the control of nanotube sizes through the coassembly of peptide entities at various ratios, allowing for the desired end-product formation. This dynamic size control offers tools for molecular engineering at the nanoscale exploiting the advantages of molecular coassembly.