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'Spring-Like' and Photo-actuated Molecular-Junctions between Nanoparticles KABEER JASUJA, VIKAS BERRY, Kansas State University — Here we present a study on (1) "molecular-spring" nano-device, where controllable and confined forces are applied on collective molecular-junctions between nanoparticles and (2) photo-actuated nano-junction system where azo-molecules incorporated between nanoparticles apply confined forces to displace them. Both systems are built by using covalently/electrostatically crosslinked polyelectrolyte (cPE) molecules sandwiched between gold nanoparticles (GNP), where cPE molecular-junctions are reversibly compressed and stretched by applying electrically and centrifugally induced forces respectively. The GNPs play a dual role (a) of movable connectors to apply forces and (b) of nanoelectrodes to measure molecular deformation via electron tunneling change. The 'molecular-spring' junctions were found to have a spring constant between 10^{-4} to 10^{-3} N/m depending on the thickness of the junction. We will also demonstrate the dynamics of these junctions via a motion-in-viscous-media model. The ability to store the compression energy in a molecular-device-architecture and to manipulate these by actuating junctions has the potential to power future molecular devices by stored molecular-energy and controlling properties of nanocomponent based devices.

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