Selective Aggregation Mechanism of Unmodified Gold Nanoparticles in Detection of Single Nucleotide Polymorphism

의윤희, 조경남, 이강택*, 주상우[1], 류판동[2], 이소영[2]
연세대학교; [1]숭실대학교; [2]서울대학교
(ktlee@yonsei.ac.kr*)

Detection of single point mutation based on the hybridization of oligonucleotides was performed using unmodified gold nanoparticles. The sequences of oligonucleotides were designed to detect the metastatic efficiency modifier signal-induced proliferation-associated gene 1 (Sipa1). The detection step was monitored using UV-vis absorption spectroscopy, quasi-elastic light scattering (QELS), and zeta potential measurement. We observed that addition of DNAs into the suspension of unmodified gold nanoparticles could substantially aggregate the gold nanoparticles and change the color of solution. By changing the salt concentration in the presence of a phosphate buffer solution, we were able to selectively aggregate gold nanoparticles for the perfectly-matched DNA, which enabled a detection of perfectly-matched DNA from the single point-mutated one. Our results indicate that a change in the electrostatic interaction is responsible for the selective aggregation of gold nanoparticles upon the addition of DNA. This suggests a novel design principle for a rapid detection of the DNA sequence by controlling the electrostatic interactions between gold nanoparticles.