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Development of cationic Ag₂S NIR emitting QDs as new generation of theranostic nanoparticles**Fatma Demir Duman and Havva Yagci Acar**
Koc University, Turkey

Quantum dots are semiconducting nanocrystals with diameters between 2-10 nanometers. Strong signal brightness, resistance to photo bleaching, size-tunable emission and large absorption coefficient across a wide spectral range make them powerful agent against conventional organic fluorescence dyes used in bioimaging applications. In addition to their optical imaging ability, quantum dots have multifunctional properties such as functionalization with targeting ligands for site specific delivery and loading with therapeutic drugs, peptides or oligonucleotides for drug and gene delivery applications thanks to their high surface to volume ratio. However, most of the synthesized QDs emit in the visible region and they contain heavy metals such as Cd, Pb or Hg, which have intrinsic toxicity to living organisms. Ag₂S QDs developed in recent years are of great interest with their excellent biocompatibility and strong emission intensity in near infrared region (NIR) of optical spectrum, offering higher photon penetration depth, lower absorption and scattering of light by cellular components and lower auto-fluorescence in the living tissue compared to visible region. Yet, the Ag₂S compositions reported are still limited to anionic and PEGylated ones. We have focused on the development of first cationic Ag₂S QDs for combined action of optical imaging and gene therapy. Here, we will discuss the synthesis of PEI coated Ag₂S QDs, characterization and applications. PEI coating itself usually do not provide luminescent QDs. Yet, combination with small thiolated molecules provide means to tune the emission wavelength and intensity. We will discuss the influence of 2-mercaptopropionic acid and l-cysteine contribution in this formulation. Further we will discuss the effect of the coating composition on surface charge, size and biocompatibility. Optical imaging and gene delivery performance of these particles will be demonstrated as well.

Biography

Fatma Demir Duman has her expertise in design, synthesis and characterization of near-IR emitting quantum dots and gold nanoparticles and their applications as optical imaging, gene and drug delivery agents and investigation of *in vitro* and *in vivo* effects of designed nanostructures.

fdemir@ku.edu.tr

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