2004.03.09

3rd NML Research Exchange

Recent Studies of Organic and Polymer Nanocrystals and Future Scope

Optoelectronic Nanomaterials Group

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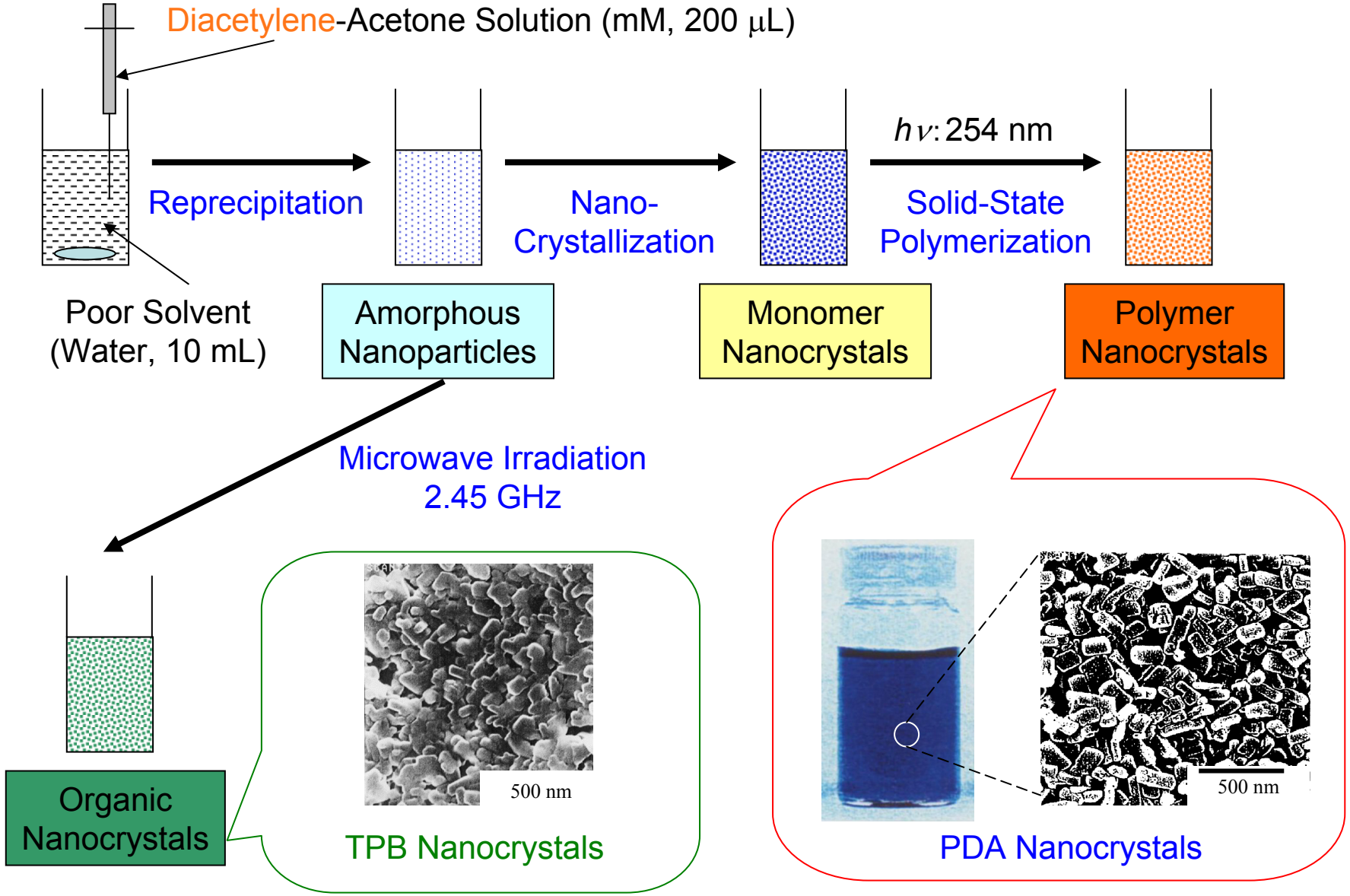
Organic and Polymer Nanocrystals

- (Quantum) Size Effect ➢ Peculiar Optical and Electronic Properties
- Hybridization with Inorganic Materials
  ➢ Core-Shell Type Hybridized Nanocrystals
- Nanocrystals Dispersion System ➢ “Liquid and Crystals” System
- Large Specific Surface Area ➢ Novel Catalysis and Medical Supplies

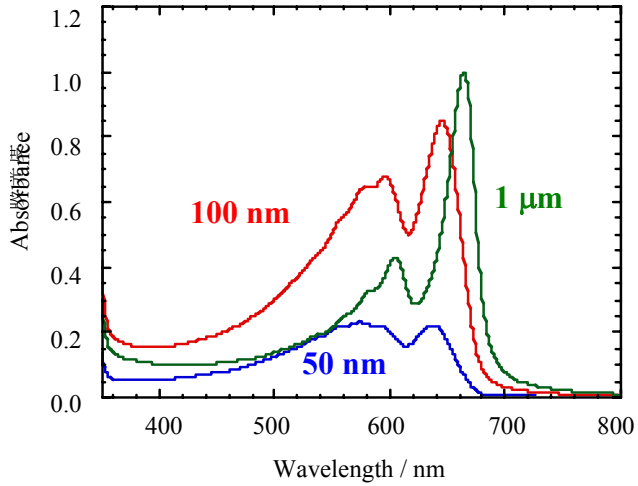
cf. Polymer Microspheres (Nanoparticles), Polymer Latex

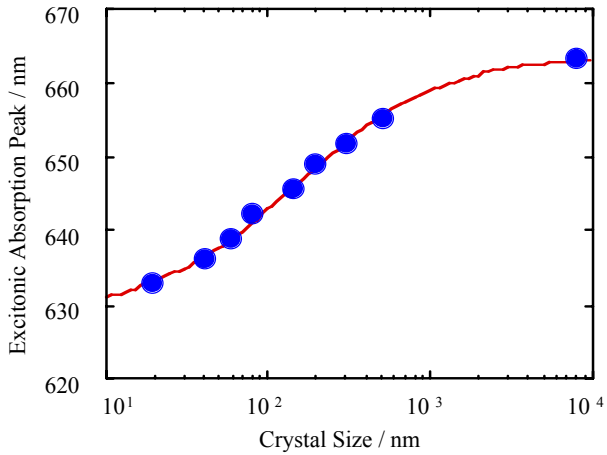
Reprecipitation Methods for Fabrication of Organic and Polymer Nanocrystals



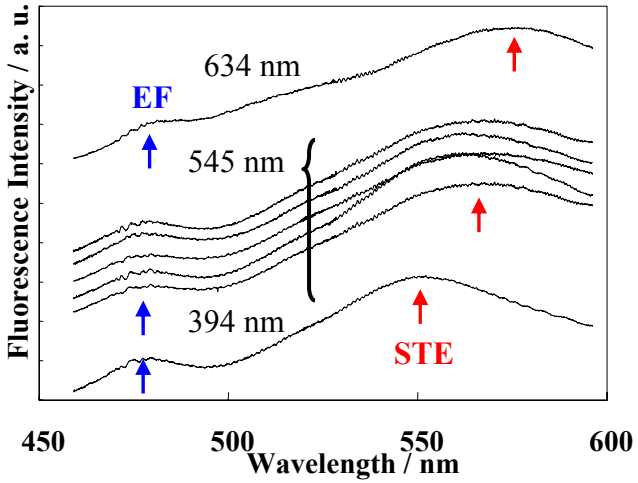
Crystal Size Dependence of Optical Properties: *Softened Nanocrystal Lattice*

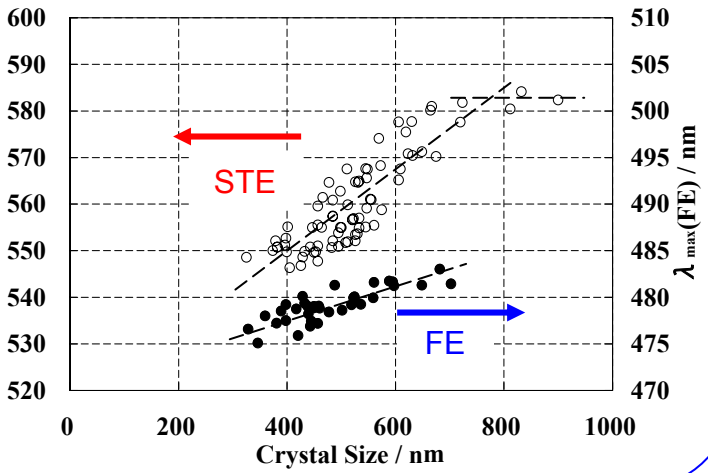
VIS Absorption Spectra of PDA Nanocrystals



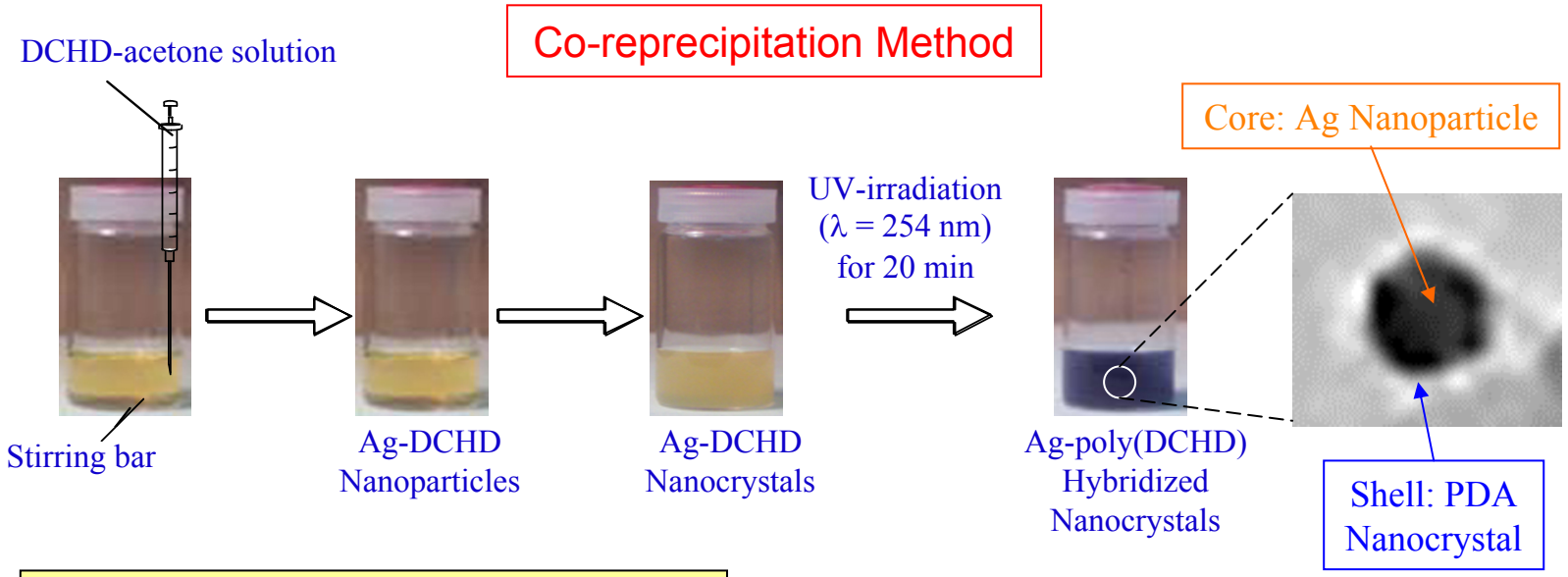


Fluorescence Emission Spectra of Perylene Nanocrystals



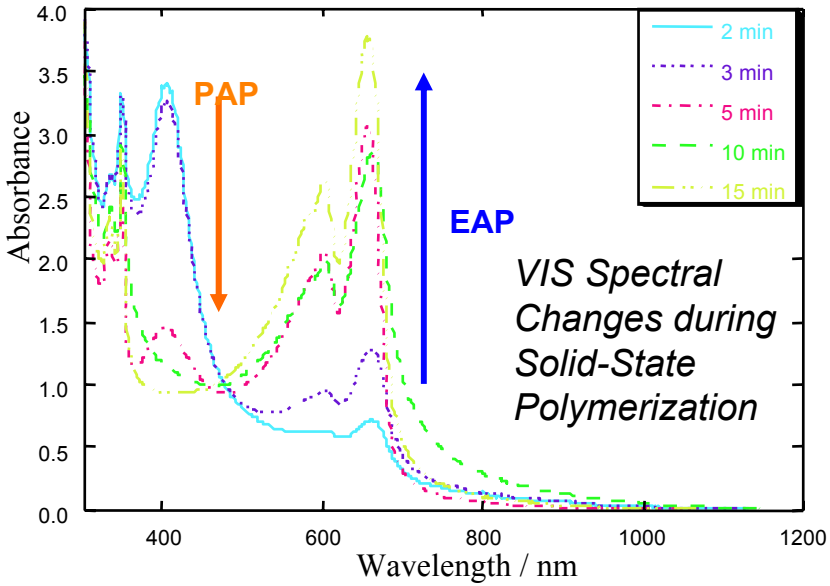


Core-Shell Type Hybridized Nanocrystals: *Hybridization of Electronic States*



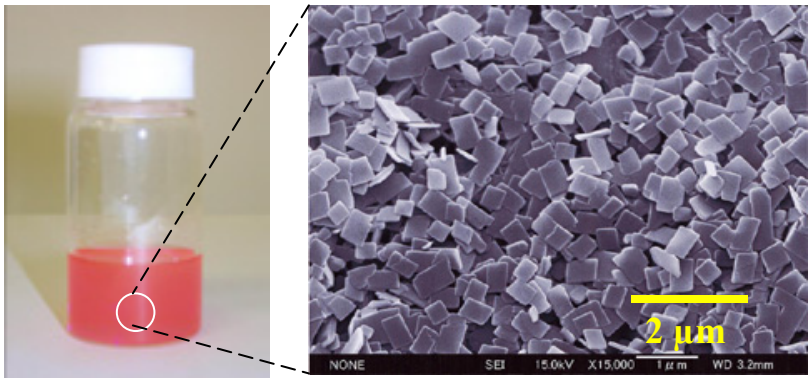
- Reduction and Disappearance of Plasmon Absorption Peak (PAP)
- Red-Shift of Excitonic Absorption Peak (EAP)

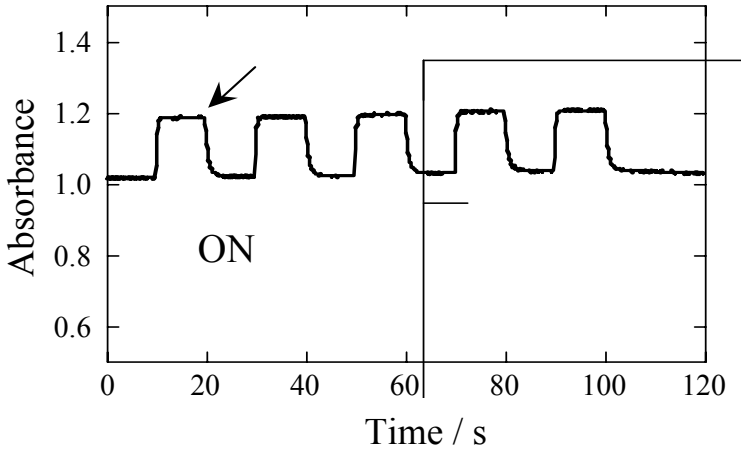
1. Energy level of plasmon is not so far from that of exciton.
2. Interfacial contact between core and shell in a confined nano-space.
3. Optimum volume ratio of core to shell.



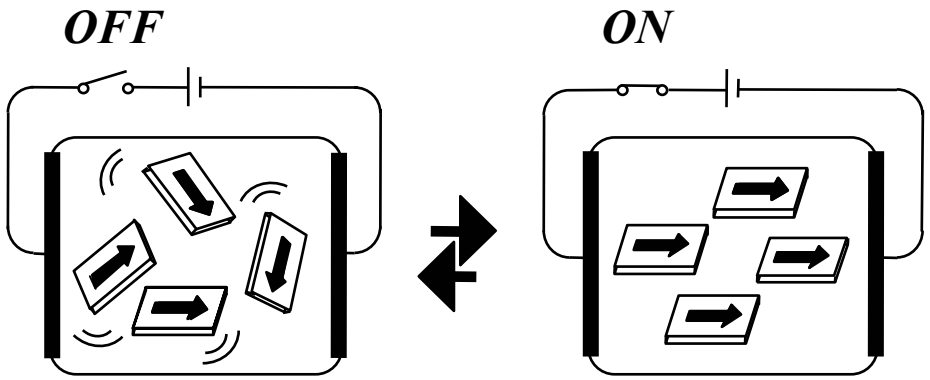
“Liquid and Crystals” System

Electric-Field-Induced Orientation of DAST Nanocrystals



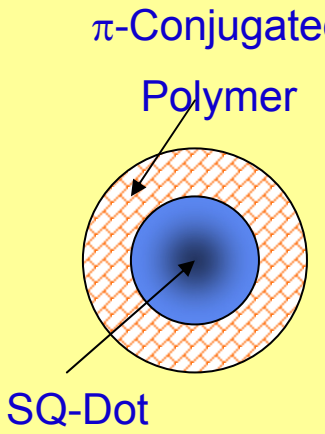


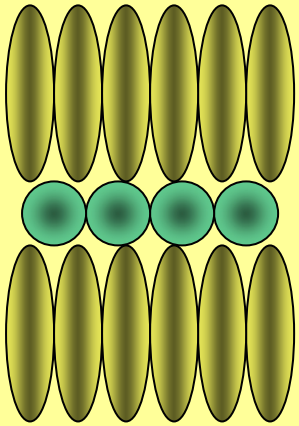
Reversible VIS absorbance changes of DAST nanocrystals, having huge dipole moment, with and without applied electric-field.

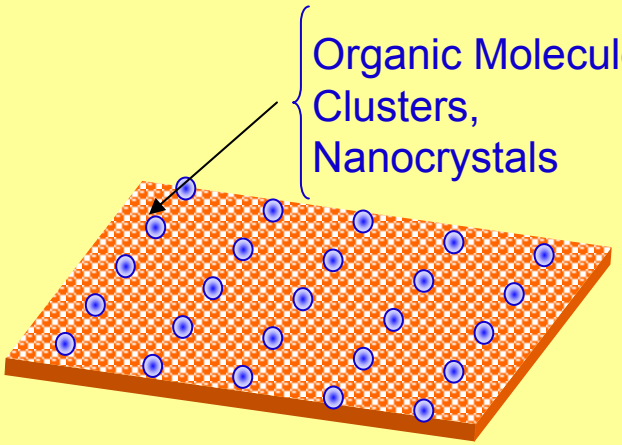


Random State **Orientated State**

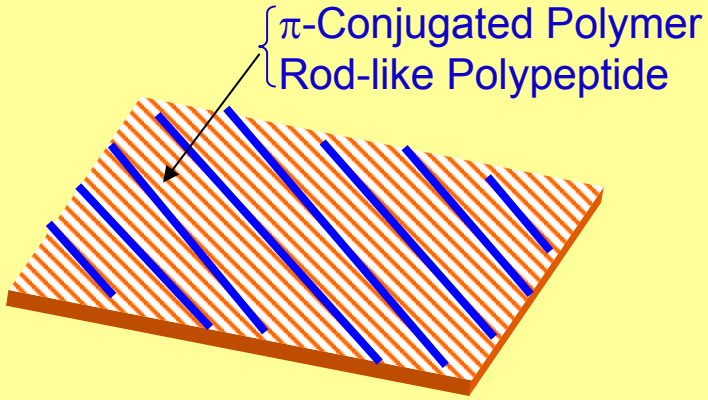
Novel Optical and Electronic Devices
Based on Size and Interfacial Effects in Hybridized Nanostructures







Hole-Patterned Substrate



Line-Patterned Substrate