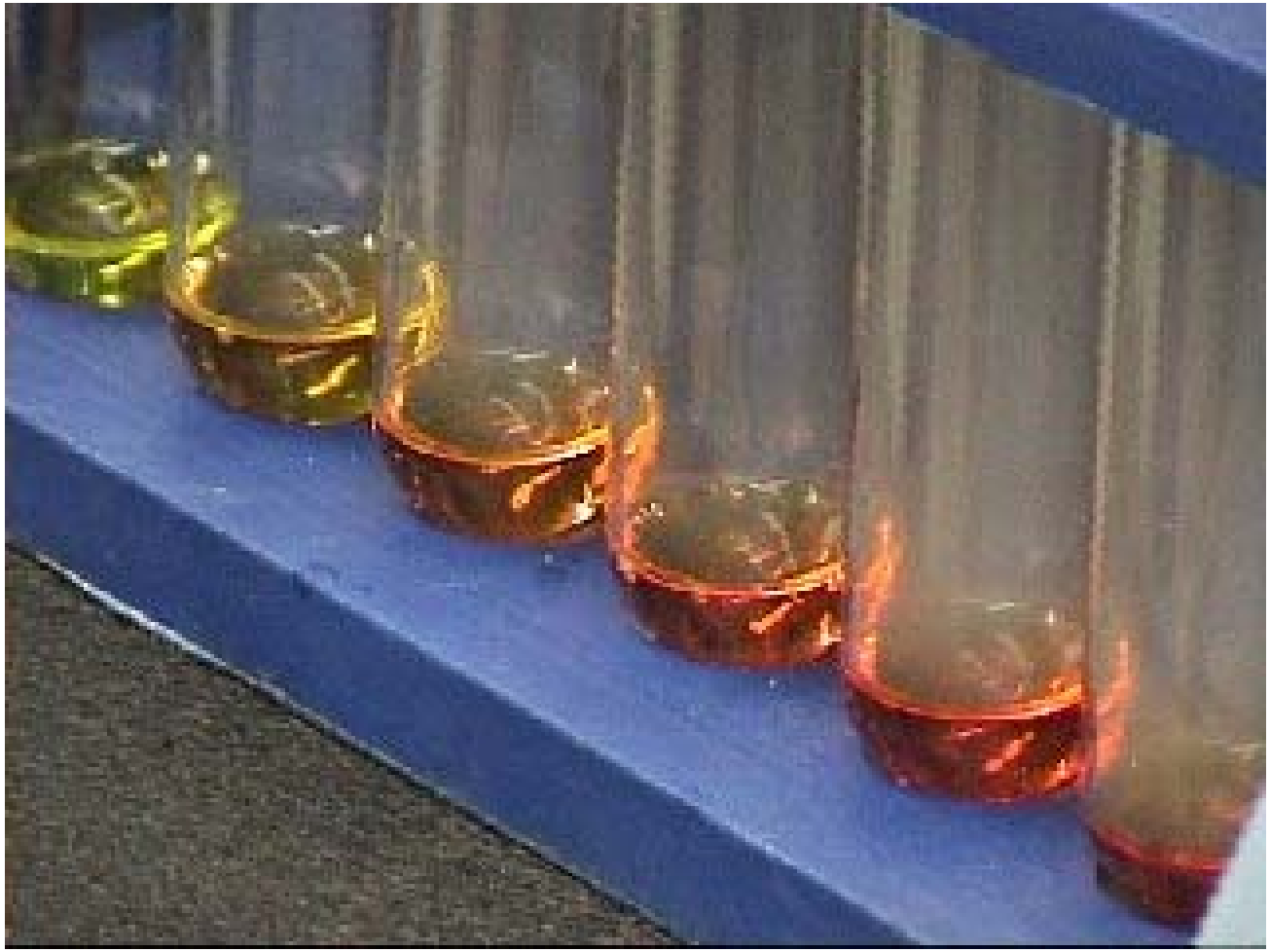
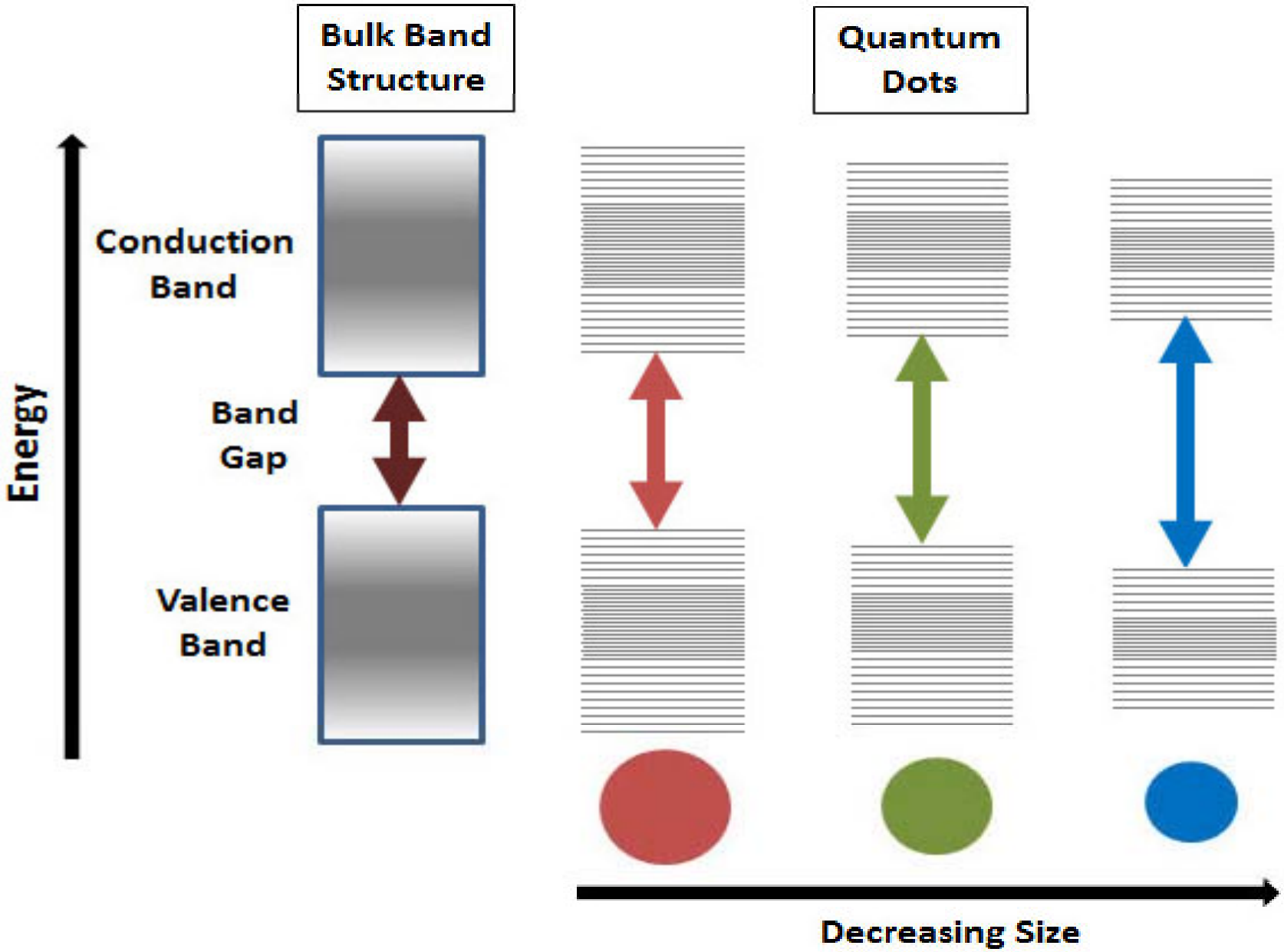
Fluorescent Quantum Dots




Bulk Band Structure
Quantum Dots
Energy
Conduction Band
Band Gap
Valence Band
Decreasing Size

Synthesis of CdSe Quantum Dots

Solution-I

Selenium (30 mg) + 1-Octadecene (5 ml) + Trioctylphosphine (0.4 ml)

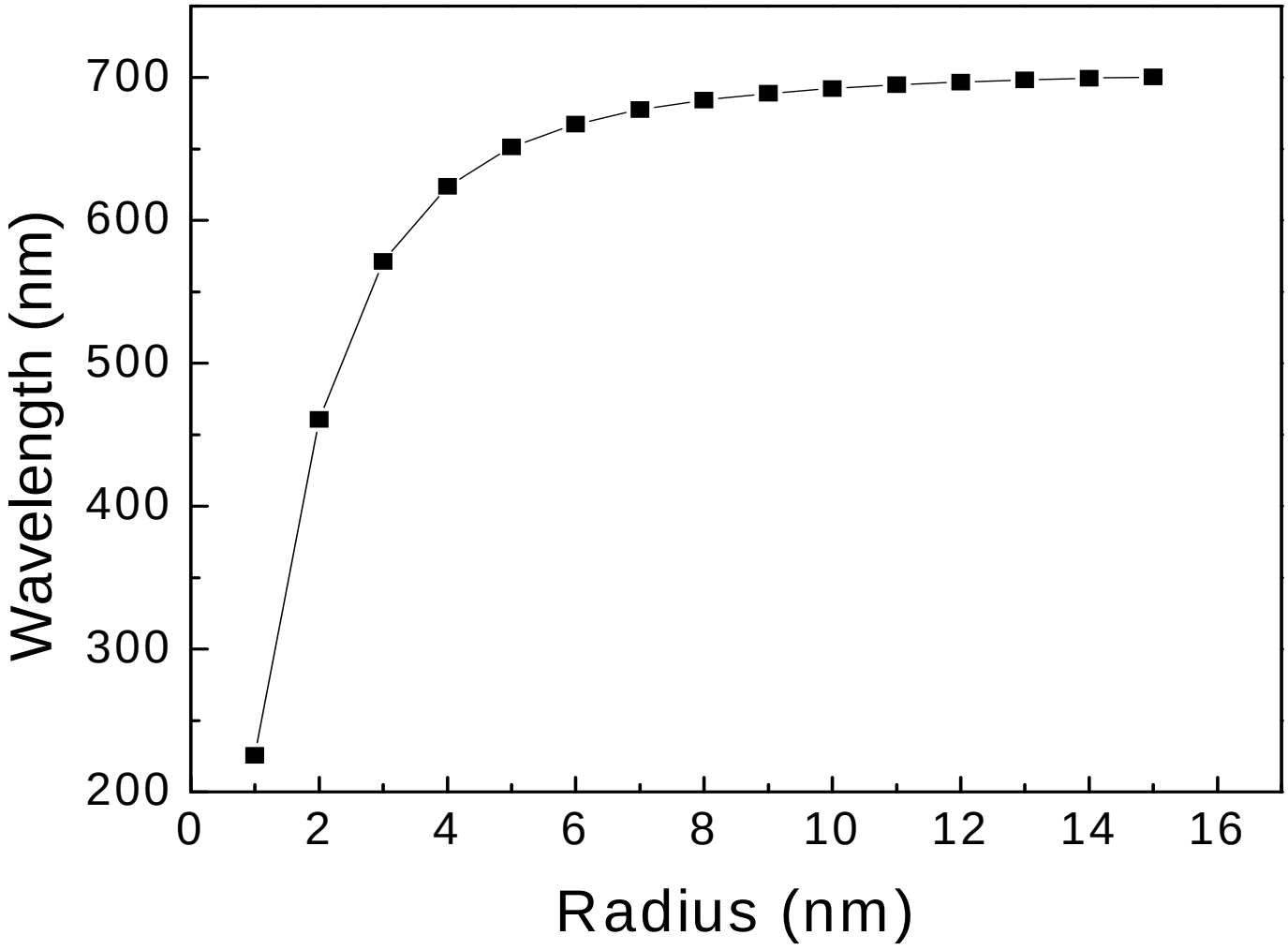
Stirring and heating at 100 C to obtain the completely dissolved selenium transparent solution on a hot plate.

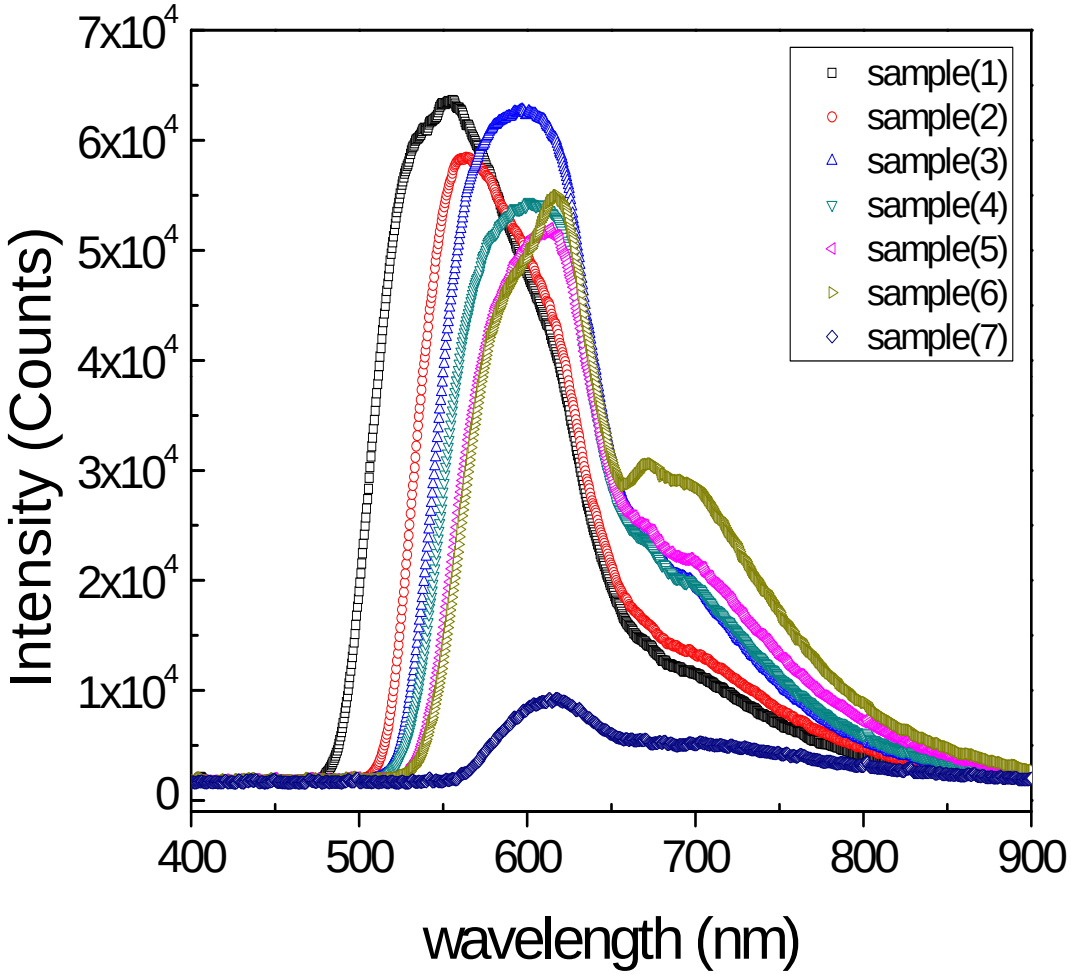
Solution-II

Cadmium Oxide (13 mg) + Oleic Acid (0.6 ml) + 1-Octadecene (10 ml)

Stirring and heating this Cd precursor on a hot plate. When the temperature reaches 210 C, 1 mL of the room-temperature selenium solution is transferred to the 210 C cadmium solution. Because the characteristics of the products depend on reaction time, 8-10 samples should be removed using Pasteur pipet after the equal intervals of time, as quickly as possible in the beginning and when noticeable color change is detected at later times.

$$\frac{hc}{\lambda_{em}} = \frac{\hbar^2\pi^2}{2m_eR^2} + \frac{\hbar^2\pi^2}{2m_hR^2} + E_g$$




7x10^4
6x10^4
5x10^4
4x10^4
3x10^4
2x10^4
1x10^4
0
Intensity (Counts)
400
500
600
700
800
900
wavelength (nm)
sample(1)
sample(2)
sample(3)
sample(4)
sample(5)
sample(6)
sample(7)

Emission Wavelength (nm)	Estimated Radius (nm)
554	2.86
566	2.96
597	3.50
603	3.64
612	3.74
618	3.89
619	3.94