Title: Preparation and Stabilization of Biodegradable Polyelectrolyte Complexes for Targeted Drug Delivery

Session: 22B02 Bionanotechnology for Gene and Drug Delivery I

Abstract: Use of nanotechnology in pharmaceutical research is receiving a significant attention by academia as well as industries for targeted drug delivery. Water-soluble, polymeric nanoparticles have evolved as an alternative to other available systems mainly because of their non-toxic and biodegradable nature. This work focuses on preparation of such nanoparticulate polyelectrolyte complexes (PECs) for targeted drug delivery applications. PECs result mainly from electrostatic interactions between polycations and polyanions and have a core-shell structure with free amine groups available on the shell surface for conjugation with antibodies, genes, toxins, and drug molecules. Core-shell structured PEC nanoparticles have been precipitated using polycations namely, poly (methylene-co-guanidine) hydrochloride (PMCG), and Spermine tetrahydrochloride (ST), and polyanions namely, sodium alginate (SA) and Chondroitin Sulfate (CS). Effect of various process parameters such as positive to negative charge ratio of polyions, pH, stabilizer concentration, mixing speed, time for addition of polyanion in polycation solution on, PEC formation, stability and morphology has been studied. PECs with size ranging from 100 nm to 100 µm have been precipitated with variation in process parameters. It is found that increase in positive to negative charge ratio, a pH of 4.2, increase in mixing speed and decrease in addition time decreases the PEC size (to around 100 nm) and increases the stability of particle size. Separation of PECs from the polyionic solution has been attempted using centrifugation which enhances agglomeration among PECs and increases PEC size from 100 nm (before centrifugation) to around 400 nm (after centrifugation).

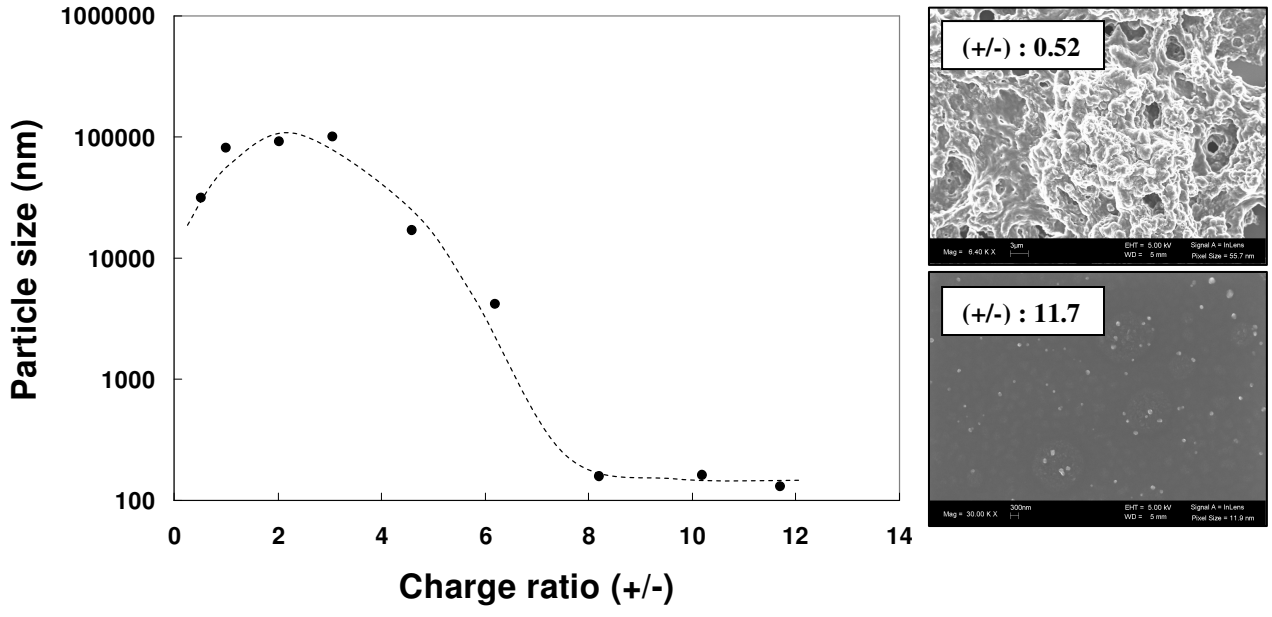

Fig. 1. Effect of charge ratio (+/-) on size and morphology of PECs