Out-of-plane alignment and in-plane growth of ordered domains in phase separated lipid multilayer regulated by interlayer spacing upon ion binding

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Lipid rafts are ordered domains within cell membrane which are deeply associated with diverse cellular processes from signaling transduction pathways to disease developments. Theses rafts sometimes produces large and stable clusters by the various interactions between them when they are in function. Of particular interests in this raft interaction research, the interaction between lipid rafts in distinct bilayers is recently emerging topic for their biological implications. This interaction between rafts across the aqueous phase has significant relevance in immune response, energy generating pathways, ion channels and membrane fusion phenomena where two protein- carrying rafts in different membranes should be aligned for efficient function. Here, using synchrotron X-ray reflectivity and fluorescence microscopy, we describe our recent findings that domain alignment and size in phase separated lipid multilayers are highly dependent on the salt concentration in aqueous phase. Further, we explain the mechanism underlying domain alignment and growth phenomena through the molecular dynamics simulation.