Tuning the Structure of Hierarchically Self-Assembled Membranes

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Membranes formed by mixing high molecular weight hyluronic acid (HA) and oppositely charged peptide amphiphiles (PAs) have been shown to have a unique hierarchically ordered structure which consists of three regions: an amorphous biopolymer layer, a narrow region of PA fibers parallel to the interface and a layer of fibers perpendicular to the interface[1]. Understanding of the structure-property relationships in these self-assembling systems is a necessary step in designing these structures for specific applications[2,3].We have studied the effect of including heparin on the hierarchical structure of membranes self-assembled from HA and peptide amphiphiles with affinity for heparin was studied. SAXS patterns of heparin-free membranes exhibited sharp peaks characteristic of a cubic phase. Upon addition of heparin, these sharp peaks gradually became smaller and eventually disappeared. The loss of nanoscale ordering correlated with the appearance of microstructural ordering of long nanofibers oriented perpendicular to the membrane; indicating the structure of the self-assembled membranes can be manipulated by tuning interactions between the molecular components.

References

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