Supramolecular Chemistry-I

Prof. Parimal Kanti Bharadwaj

Department of Chemistry

IIT Kanpur

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Good morning. So, here we are almost at the end of the lectures and I usually talk sometimes more than once on a particular topic for clarifications ok because sometimes I may forget some points and all that. Now first of all I will tell you few things about single head and single tail besides single head and two tails amphiphiles. Both can form micelles especially if the headgroup is charged. They can also form reverse micelles. Now, when they will form a micelle? They will form micelle in solvents of high polarity. Micelle means outside you have head group that is hydrophilic in character and inside you have hydrophobic. What we see is well maybe there could be some solvent molecules inside that is very small whose property will be different from outside bulk solvent.

Micelles have outside hydrophilic in character. So, solvent of higher polarity like in water if I put the amphiphile, the hydrophobic tails will try to be away from water because water has very high dipole moment, i.e., high polarity. So, it will try to avoid water that is why it will be inside and outside is the hydrophilic part which is in contact with the solvent ok. So, micelles will form in high polarity solvent and this interaction with high polarity solvent will have some enthalpic gain although we lose some entropic energy because entropy will be slightly negative as it comes to order from randomness. And what will happen to the solvent of low polarity like say hexane or toluene the reverse of this process will take place i.e., hydrophilic part inside trying to avoid the solvent of low polarity, but the hydrophobic part can interact with the solvent called hydrophobic effect which is a strong attractive reaction and they will be enthalpy gain although like before will have entropic loss. So, like micelle, reverse micelle is also spherical in nature.

The cryptand based systems we have shown earlier has three carbonyl groups each with long alkyl chains. All the alkyl chains are on one side because of the carbonyl groups. When another cryptand with alkyl chains comes near, the alkyl chains from both the systems will intersect each other and this will form an unilamellar vesicles. So, this is unilamellar but what is multilamellar? All of you have seen onion. In a onion, when you peel the top part off, then there is another part then you peel it off. So, we can peel off

and it has a central cavity like the one we have seen for unilamellar vesicles. I shall show you the tunneling electron micrograph of vesicles as follows:

This photograph I showed earlier also. You can see individual vesicles. Now I will tell you there are numerous uses of these materials in biology ok. In biology what can you do? I can put only one tail one tail is good enough and then in these two positions I can put a drug molecule through intermolecular forces. I can put an antibody in the other bridge that will go to that affected place. And so the medicine will reach near the place where needed.

If the head group is a cryptand and a metal ion like Co^{3+} included in the cavity it becomes an amphiphile with a charged head group. The hydrophobic tail will allow this system to be close to the membrane of the cell which is also hydrophobic. When the charged amphiphile reaches near the membrane, the +3 charge helps disintegrate the membrane. And the worm will decompose.

Now, I tell you about the LB technique. Langmuir Blodgett technique is the most effective way of depositing thin films onto solid surfaces with precise molecular dimension. My next talk would be on LB technique. Thank you.