Supramolecular Chemistry-I

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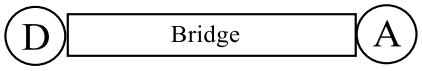
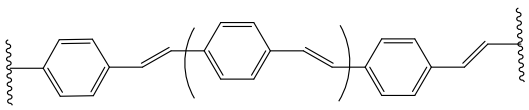
Week - 07

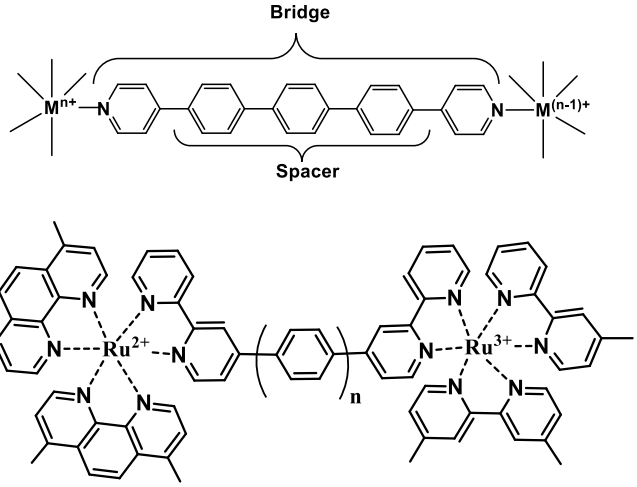
Lecture - 31

Welcome back, I will now show you about molecular wire. The design of molecular wire is probably the simplest in molecular electronics. So, the basic thing is in a broad sense a molecular wire can be any molecule that is able to mediate electron transfer along the chain between donors and acceptors. I will tell you first that broadly there are three mechanisms for the operation of molecular wire. The number one would be our familiar photo induced electron transfer. So, photo induced electron transfer mechanism can be used in devising a molecular wire. Then number two could be electro chemistry of electro active assembly where you may put differently charged transition metal ions at the two ends. So, number three would be conductance. Of course, with the passage of time, several other mechanisms of electron movement along the chain of a molecule can be devised. Molecular wire became very popular subject of research recently and so many groups around the world have made so many molecular wires. So, here is an a simple example of a if I have to make a photo induced electron transfer based molecular wire I will put a donor here donor in one corner then a bridge this is my bridge and then acceptor. When a highly delocalized organic bridge connects the donor and the acceptor, the bridge localized states are no longer virtual and the electron transfer proceeds via real injection of electrons into the wire. In such cases, the bridge acts like an ohmic conductor with a simple inverse dependence of the electron transfer rate on the distance between the donor and the acceptor.

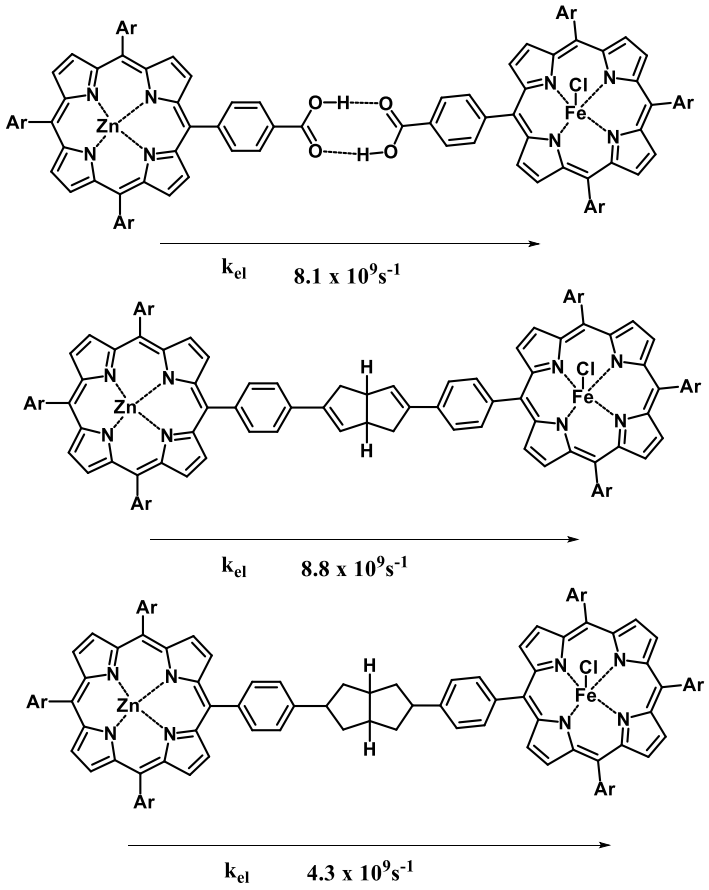




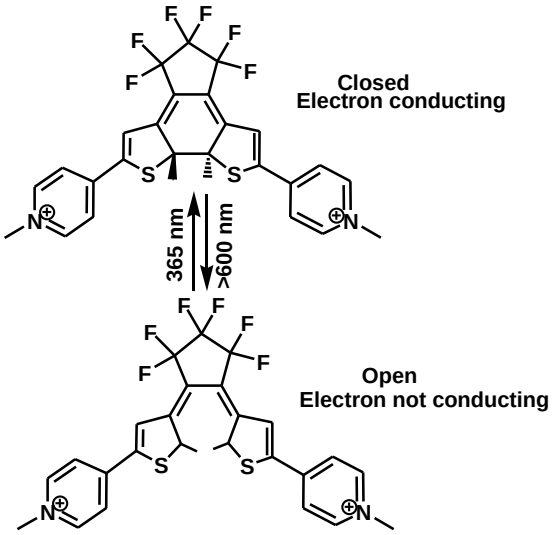
Let me show some molecular wires synthesized by different groups:



So, remember that this length of the bridge can be really long. And here this and this n can be really big and these molecules I mean several nanometer in at of length they have been realized.



If there exist molecular wires, there has to be a molecular switch. What I have drawn below is the example of a molecular switch.



As I have written here, it is self-explanatory how this molecule works. I stop here to-day and from next day I shall start another new topic.