Supramolecular Chemistry-I

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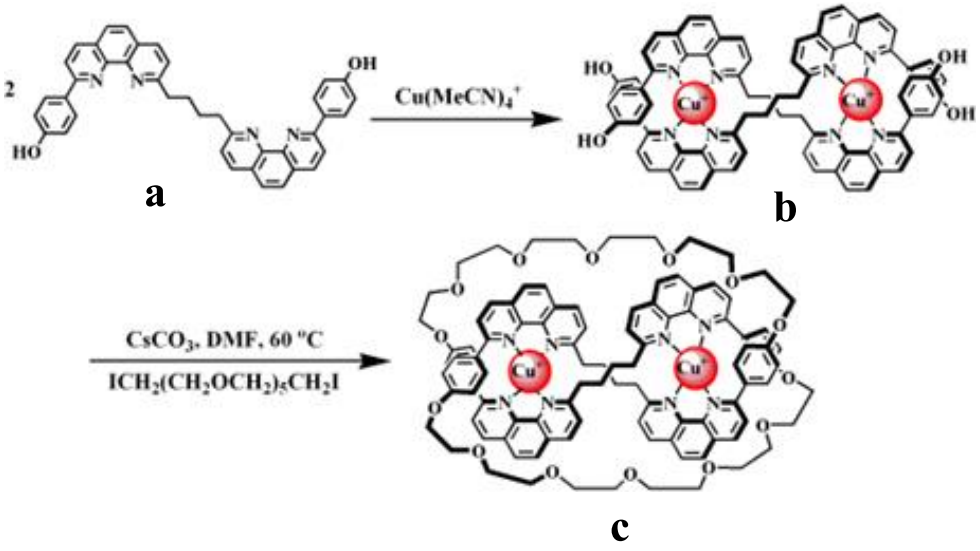
Week - 04

Lecture - 19

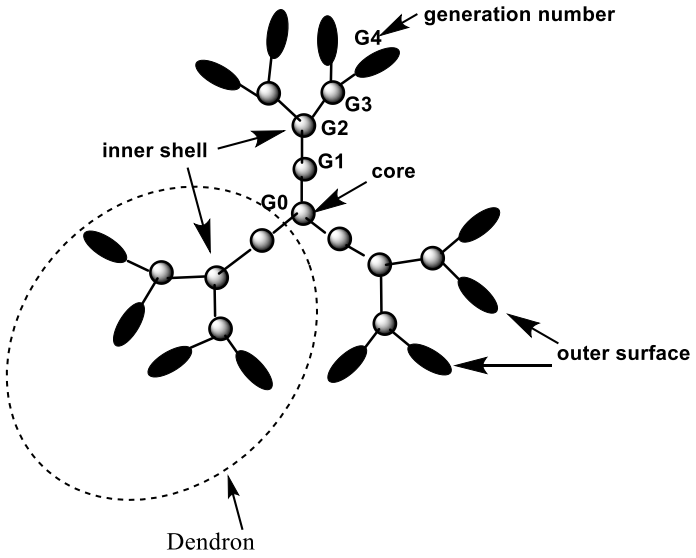
Hello, I was trying to make a trefoil knot, I did not have time. So, that is what I am trying to do it again first ok? What we want is a ligand with special characteristics and a Cu^{+}-salt that makes tetrahedral coordination geometry. The ligand should have ends that are quite rigid and the middle part of the ligand should be quite flexible. As a result, we have designed the ligand **a** as shown.



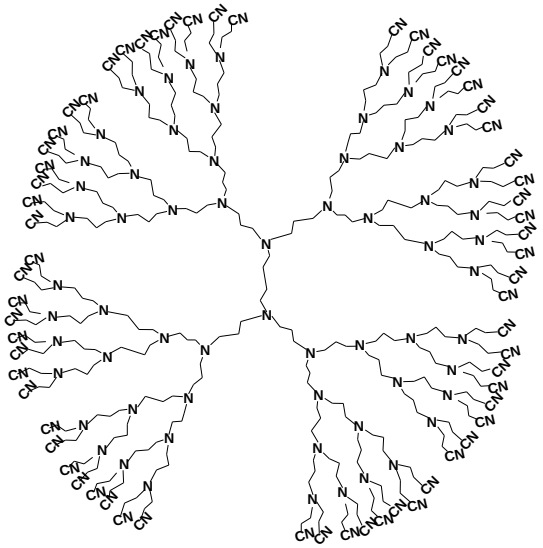
Our flexible part is a saturated alkane chain which is 4-carbon long. The chain length is normally determined empirically. Now when we add a Cu^{+} salt, it forms a tetrahedral coordination geometry with two phenanthroline moieties of two ligand units. In this case, tetrahedral coordination means two phenanthroline moieties around each metal ion will be oriented perpendicular to each other. Now, if one ligand go over the other one, then we get the complex **b** as shown. In **b** the phenolic OH groups are oriented away from each other. Now a linear chain with proper length can be used under basic

condition to join two OH groups. It is not it is kind of difficult to visualize, but if you do it at home with maybe two threads, two people doing it will form a trefoil not, **C**

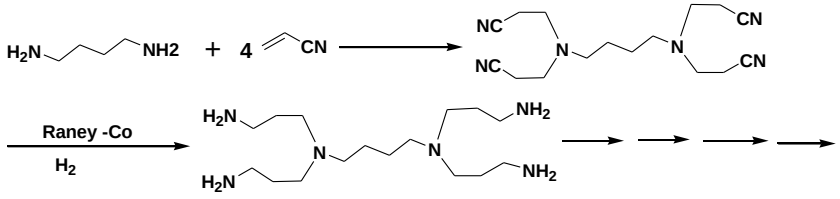
So, this knot compounds are over right now I will be talking about dendrimers. Dendrimers are highly branched polymers. The structure of these materials has a great impact on their physical and chemical properties. As a result of their unique behavior, dendrimers have found a wide range of biomedical and industrial applications. These molecules constitute a type of macromolecule in which a number of chains radiate out from a central atom or cluster of atoms. Dendrimers can be considered to have three major portions: a core, an inner shell, and an outer surface that is functionalized (refer to the cartoon). Ideally, a dendrimer can be synthesized to have different functionality in each of these portions to control properties such as solubility, thermal stability and attachment of compounds for particular applications.Let me show you the structural features of a dendrimer. For this we have shown a cartoon form of a dendrimer.



You can understand that we have to stop here at the site called periphery. Beyond the periphery, the units will collide. The inner part has molecular recognition points. So, a guest can come inside and it will be protected from the outside. It is a 3D structure you can understand that is like a ball. In the middle of the ball you have core and then it is coming in all in 3 directions then what will happen? It will happen something like the above. Let me show you another dendrimer as follows:



Here the core has a different structure. Also, looking at the figure you can understand that after a while we have to stop and that will define the periphery. So, we get a denrimer and what I just showed you this method of synthesis is called divergent method. The divergent method starts from an initial core and branches out to the final product. So, it will go on like this will again go and it will stop at some point because the cyano groups are almost touching each other.



There is another method of synthesis called the convergent method which we shall discuss in the next lecture. Thank you.