Heterocyclic Chemistry
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Lecture - 24
[4+2] Cycloaddition in Heterocyclic Chemistry (Contd.)

Good morning, if you recall in the last class we talked about these 4 plus 2 cycloaddition right, in the heterocyclic chemistry. And the briefly if you review what we exclusively did in the last class; that cycloaddition of the furan might in most cases. And the scope of the reaction is somewhat limited to special kind of substrates or dienophile. You have seen that the furan molecule the dienophile must be preactive like alkyne, alkynyl or I mean alanyl type of molecules or else if the dienophile is little less active we have to make the other part more active like if you have a let us say double bonded compound. So, you have to have benzoisofuran, where these furan might is little more active for rest of the cases like if you have a double bonded electrophile like maleic anhydride; the reaction takes place for simple compound without any problem. Because maleic anhydride is such consider to be a very reactive dienophile.

But again in the synthesis of cantharidin you have see that this glycerol is not that easy. But that is a sort of problem can be levitated by either using high pressure or Lewis acid. And but in the case of the intermolecular reaction the situation is little different; even the dienophile is just simply a carbon carbon double bond that would also be active. But it is somewhat like an ((Refer Time: 02:07)). So, the reaction takes place without then we went to this important other things; that is since of pyridine means diatomic compounds; this oxozone that was a given. And you have to today a small correction; last time if you recall we begin with it oxazone derivative.

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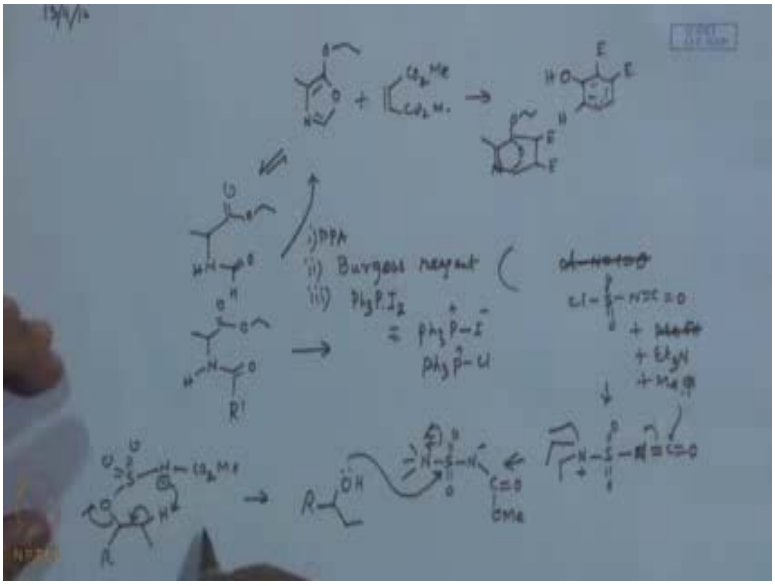

And, you can consider to be an furan analog and where so oxazone can undergo reactions of 4 products to 4 cycloaddition reaction. And eventually it gives a pyridine nucleus this structure was a wrong in the last time; actually the ester should be in 3 and 4 positions whether and this OH as a 3 positions sorry, 4 and 5 position and OH is in 3 position. And then that is the hydrogen of here. And so intermediate just do a small corrections last time also we did these we missed one nitrogen. So, their nitrogen should have been in the position here. And then as usual this ester here and this is the o ethoxy; and the catalyst was new delirium triflate.

So, what it means that if you have a double bonded kind of dienophile the reactions could be little sluggish. And then also we talked about the this is isoxazole how do you make isoxazole? Isoxazole are made wise cyclocondensation of the corresponding compounds the way one can do it just actually the sort of you start from this NH. And then what this is basically formamide and then you have to have a ester group and oxygen and ethyl, right.

So, if you see this one can be this is nothing but it is something derive from corresponding amino acid. Amino acid will have a carbon, a carboxylate; and this amino group same carbon. So, if you functionalize this NH to give up amino acids; and formisations or else I mean one can also do let us say acyl chloride. So, if you can take acyl chloride kind of thing and so you can get to the let us this molecule. For example,

let us say R 1; and so you can get this set. But only problem is the if cyclodehydration; how do you do it? So, essentially you have to have a the dehydrating agent one of the dehydrating is a commonest dehydrating agent what we said as PPA; Polyphosphoric acid. How do you make polyphosphoric acid? It is met out of phosphoric acid what else? P 2 O 5.

You, basically you have to remove some more water; and then you have to do the condensation sort of so you say, so nice way have doing it; in other possible there are plenty of dehydretic agent all of you know right one of the sulphidation is also commonest one, b c c also there, b c c. But this is not very effective in these case alternatively other than PPA; this you can go this sort of compound one of them is PPA other I said what but just reagent. Then I mean you can go on talking about many thing next thing is this is very useful and triphenylphosphine iodine complex; especially this is very useful for oxazole sort of compounds. I mean one can go on talking about any other possible; but these are the reagents which have porovent we very effective in the formation of the isoxazole.

So, iso that means formation of isoxazole is not that tough, but if you will have the rights so iso of the dehydrating agent. And I told you to go through but this reagent, how many of you just typed ((Refer Time: 07:09)). But this; no body that is kind of bad; how many of you have heard of Dr. Mani Lal Bhaumik bigant. I want to see bigant; because yesterday in my lab I ask you one nobody knew that. So, but so similarly, I mean but I last time I talk, told you. Say, very simple reagent thought is made from chloro isocyanate; and then sorry chlorosulphonyl isocyanate.

If you goes and add methanol and then at a I think first you have to add sorry first you have to add triethylamine and then methanol. What you will see? Actually, sulfone part is intact, the chloride is removed; so you get a quaternary nitrogen here. And then N C O and that goes to so N plus, so then goes to this is a methanol adds to this carbonyl right. And so you get a carbonyl. So, essential it is kind of salt plus nitrogen and minus nitrogen; this is actually what this reagent. This is easily prepared from just this is all this details are considerable level; this is an one of the nicest dehydrating agent; very nice mild kind of dehydrating agent.

The mechanistically this reactions also gives the olefin in this elimination fashion. That means, primarily works for secondary and tertiary; like any most of the dehydrating agents very useful for secondary and tertiary; in case of primary etherification take place right. And then will come back to that any other reagent available for dehydration of alcohol known to you other than sulfuric acid; do not talk about sulfuric acid mild sort of a mild dehydric agent; even this sort of compound like carbon tetra chloride and triphenyl. If you have a diol, one diol; let us say. You can just do this cyclo etherification. So, cyclisation can take place by cyclodehydration. So, is similar to triphenylphosphine iodine. Triphenylphosphine iodine means, you have this one phosphonium plus and iodine minus right.

So, carbon tetrachloride and triphenylphosphine is a exactly same equivalent to this; some name reaction it is right. What is the name reaction? Something like that. So, that is equivalent actually in C 2 the reaction produces this sort of species. So, whenever you have of a phosphonium kind of sort; we can here, we have an ammonium salt. And let us say you want to do a dehydration kind of thing. So, what is expect it here. This alcohol part who displays the amine; so what you will see? Then this is sulphone is there light then O and this R. And then you have hydrogen of here right. And then N this is minus I sort of a carbonate moiety; and this so what next basically, so you will have this intermolecular kind of hydrogen transfer or abstraction. And then you have a beta elimination and if the sulphonate comes out; and eventually what you get? Is a like this. And this elimination of oxygen and hydrogen and actually takes place elimination.

So, exactly same thing happens here. And but this in these case the activation actually of N H is done by this. And eventually if you look at this mechanism if you go this way; then eventually this water is eliminated. So, that means if you have a cyclic acetal or hemiacetal kind of thing; that would undergo elimination to provide the corresponding oxazole derivative. So, this is one way of doing it. Then this will has very similar fashion if you have an oxazole; but just change the, I mean reacting partner for example, to maleic anhydride the reactions precedes very smoothly.

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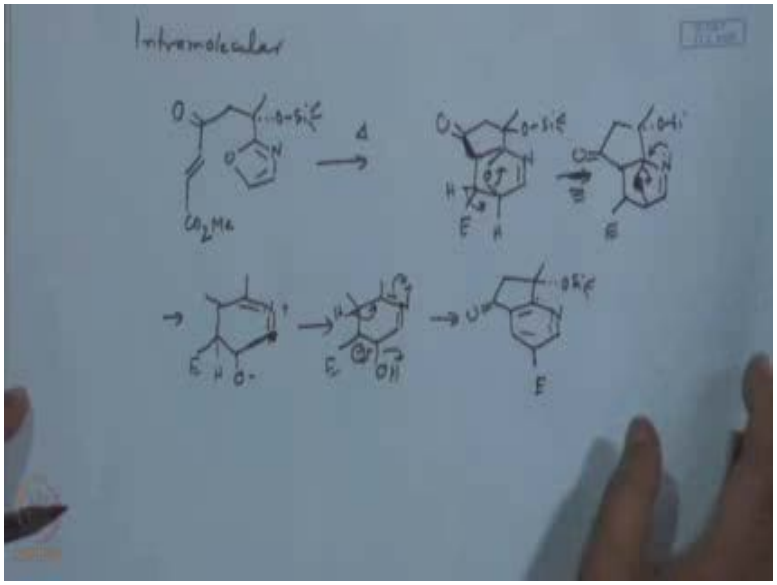

And then example of the intermolecular version and again maleic oxazole; so oxazole means 1 5 a 1 3 heteroatom. And then if you have a system where now; you have a double bonded compound double bonded dienophile like the previous will say ester. But it is little active, more active again by the presence of one more electron withdrawing group. And then we have all kinds of this functionalization in these cases tertiary alcohol and corresponding the silyl protected group and the reaction.

So, what is the product? That means it is one of the that means basically, by giving you this example, I mean to demonstrate that these sort of reactions are very useful for constructing sorry pyridine nucleus with multiple substitutions. What you will see; and then the reaction of course, the reaction conditions are upon a just heat; and so what is the product. So, I think all of you can work out the product right. So, the way I have written. So, it looks like it is a intramolecular diels alder reaction right. So, if you put here and then is a double bond here. And this is ester and then alpha 2 this is a sorry this is a ketone. And then you have these and this oxygen and this is group and the double bond will of here, what next?

Is there any chance that of the that is what you have to keep in mind; is there any possibility of rickert diels alder reaction; so that means Alder rickert reaction. Whenever, you are doing a some many actions; you have to all just by looking at this structure you have to be able to predict that. Then only you can write the final product so is there any

possibility rickert reaction; means rick tudual reaction. See what you have to look for rick tudual reaction you have to have a 6 membered ring say be it a carbocycle be hetero aromatic, aromatic or sorry hetero heterocyclic. So, you have to have a 6 membered and double bond or multiple bond triple bond. So, I see a 6 membered ring and it contains a double bond. If you see the diels alder reaction that means this is there is possible or it will go back to the starting material. Now, new product would come that means the then what is the other possibilities under these conditions; you have an eliminate I mean product hydrogen that can undergo elimination right.

So, on sometimes these some more very favour is one of the driving force. So, you have this oxygen or else you can this another way of looking at or else you can look at this way. That you have a or write this is I think this one would be the prefer path way oxygen of here. And this E and this is a 5 membered ring with a ketone. And the adjacent group is oxygen and silicon and there is a this normally hydrogen has a propensity to expel the oxygen right.

So, there is a possibility that it would first from this sort of thing; and then eventually it will undergo aromatization. So, we can I mean although it were some more strength, but you can mean just go on writing this is E this is oxygen minus and then you have all other thing. Then the hydrogen can undergo this location well to the O H then E there you will have minus here, and mean while both this hydrogen sorry I think mistake there this is 1 nitrogen; so plus so this hydrogen now undergo just a elimination; and this may be undergoing a elimination.

So, eventually the all the through to all the steps we are going to get what do you get is a pyrroline sorry pyridine nucleus. And what else you have 5 membered ring on one side; you have the ketone other side you have the silicon substituent; and the metal substituent. And then 1 2 and this would be the 3 position is occupied by an a ester group. So, as a whole what is the lesson we learn that oxazole are very nice dienophile in case of this dienophile sorry diene. And they undergo nice the diels alder reactions and result is that the construction of pyridine; and as you can see these you have a bicyclic pyridine nucleus. And the substituents are as it is then will go to that means so far we have somewhat like is standard kind of diels alder reactions; and in only one case last time we saw and inverse electron demand diels alder reactions.

So, why do we see the inverse electron demand diels alder reaction? what are the inverse electron demand diels alder reactions? That means the diene the diene part should be electron deficient; so when do we see diene part electron deficient under what circumstances; no diene is electro deficient. How do you make the diene electron deficient? They would be standard way is to put so many electron withdrawing groups; electron withdrawing that is the standard way of making a diene electron deficient compare to the normal structures parent structures right.

What are the other mechanism? By which one can make the diene electron deficient ((Refer Time: 21:06)). Yes, fine so if you have a substrate having an atom which can undergo coordination with electron deficient. So, essentially yes you are basically making that is also a any other way; you have a diene system for example, no electronically you have to make it electron deficient. In the last class I have given example is 5 membered ring. So, let us say we have a 6 membered.

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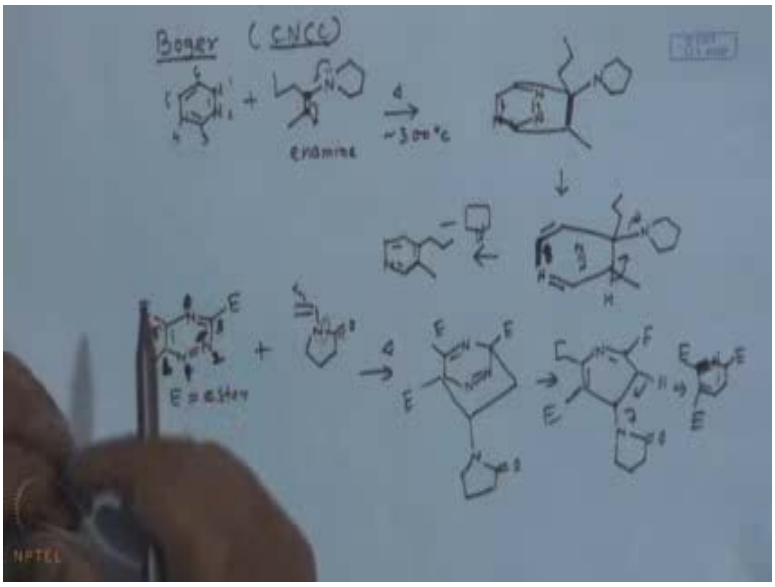

For example, you have a diene of this kind let us say so compare to our parent system diene is it electron deficient, yes or no? Yes, because you are putting an electron withdrawing atom. So, electro negative atom basically electro negative atom. That means if you put more number of electro negative atom the whole diene system; this should be a important diene; and which is electro deficient. And this concept was of course, this

called somebody else but the scientist name Dale boger. I do not know may be many of you heard Dale boger; he research institute; he popularized this reaction.

So, some people some time call bogers reactions. And what did he did he put as many as 2 nitrogens in this ring systems. That means triaging so triaging so if that is this is electrons deficient diene; then you have to have electron this alkene and electron this alkene could be I mean this is a say propyl change here. And this was one of the earliest example. So, what is this by looking at we can say it is an enamine that means enamine double bond. So, this example say enamine double bond also participates in a diels alder reaction provide the reactivity nicely matches; little high temperature is required. If I recall it is close to the reaction takes place at around 300 centigrade.

So, all of us can now the question is see if you add this what should be the structure? How do I we find out the structure? See, that means the this is the these are the 2 carbon atoms right so these 2 carbon atom that means it will add to the 1 core end of a diene system. So, you can take this as diene system, I mean all any four combination atoms would be a diene system. Because the bonds move right or not moves I should say I mean it be picturised in any way; by because so that means any 4 bonds component of 4 atom component could be taken as the diene. But why do we see this nicest weight to predict these is to first see the because inverse demand diels alder reaction.

So, look at the dienophile part. So, that means in this case this is this the electron density increase at the beta position of the enamine; that means this one is electron reach fine, I mean you do not have to do all calculations that is hand driving calculation is perfectly all right. Now, in the triagine which one is electron deficient that is it. Once, you fix the 2 atoms then I rest aromatically fixed which one? Let us say I will give you the numbering 1, 2, 3, 4, 5 and 6. So, which one is which atom is electron deficient in triagine, 3 ok; which one so why not 6 right. That is a possibility actually, 3 and 6 both are equally possible. I go will one can say nitrogen more electronegative with an carbon. So, possibility 3 is more. In fact that is what is happening any case, but for us and let us see what happens actually and the reaction takes place at 3.

So, that means these N moved add to this one. So, how do we write I think I will write in linear fashion, that would be better. So, this nitrogen here and then this adds here. Then you will have a methyl group sorry this is nitrogen then this is that pyrrolidine ring. And

you have a profile chain. And then this is then 1 4 that means 1 2 3 4. Now, that this portion becomes the diene part. If that is so the middle bonds are the double bond. And this is basically at the moment it is just innocent it is taking part; and that is it that means if you can rightly identify the most electron deficient atom in the diene part. Then it is easier to establish the regiochemical problems and the corresponding regioisomer and what next so that now you have to first of all yes yes((Refer Time: 27:35)).

So, is it satisfying? Yes, so there are 2 double bonds and within the 6 membered ring there are 2. This way and the nitrogen side nitrogen obvious very obvious why nitrogen triple bond energy is very high; so that is it or the reaction if the otherwise takes place; it will go back to the starting material. And so that means a write the way it is already written and sorry this that means I think this write looks better. So, nitrogen comes out right. And then you all have a double bond methyl substituent and the propyl substituent and the pyrrole ring system right. But the bonds are not fixed so the bonds will be fixed here, the bond migrates and this what next there is no other conditions.

Basically, what next, actually then there is under thermal conditions aromatisation is such strong driving force under thermal condition you will just the pyrrole ring; so it loses Pyrrole ring. So, eventually what you will get a pyridine derivative right. Pyridine derivative with a 3 position and this propyl chain. So, 3 4 di substituted pyridine 3 4 di substituted pyridine. So, why is it so important first of all so many things to be learn first is enamine double bond participates; then trayagine isoelectric deficiency undergo reactions. The ultimate net result is a pyridine derivative. Well defined one single isomer and di substituted and is a very important one, because if you try to just think about alternative synthesis for any synthesis; actually you should start thinking alternative synthesis.

If you can come up with it easier synthesis; that means that synthesis is not that is not merited. So, if you have let us say synthesis which is more difficult than this one easier synthesis. That means the pyridine derivative that the method is more powerful that is it. And for a moment is just think about making a 3 methyl 4 ethyl pyridine. How do you make? Of course, in heterocyclic chemistry especially in pyridine chemistry these electrophilic substitutions are very limited not well defined. So, the best thing is to approach a pyridine molecule by constructing the ring. And obviously the first choice should be the cycloaddition reactions. And let us look at and see whether you can there is

a one more example I have where you have again a triagine; and now it is sorry triagine and you have all the 3 positions are substituted by ester. Actually, an ester fine and this is pyrollidinone and this an n vinyl pyrollidinone I heat it.

So, what do you expect? So, you have to first write the intermediates reaction. So, the way we have been writing from to make of now we have already known that triagine diene system electron efficient diene system. So, this should be an electron reach dienophile. And now you have to see the very intersections; so although you have a carbonyl group here. But this has this is a well known though this nitrogen actually directs this electrons towards the beta positions. Once again like the amine case this reaction takes place on the beta carbon fine. I mean assuming that let us say whether we come up with structure ok.

Now, here what are the which are the number of so 1, and 2, 3, 3, 4, 5 right numbering is wrong right this way 1, 2, 3, 4, 5 and 6. So, this beta carbon attacks one of these carbons there. Somewhere, which one so that means we are saying 1, 2, 3, 4, and 6. So, you have to identify the diene component. In this case I mean the previous case you have identified 3 as the most electro efficient carbon fine. And this should diene was 3, 4, 5, 6. In these case also you can just very quickly, because now we know that nitrogen eventually would eliminate right all these reactions.

So, you can just ignore the nitrogen part; that means the rest before carbon atoms are the actually the dienophile and normally in most cases like; actually it gives CNCC component. CNCC and that means 1 carbon nitrogen carbon and carbon are supplied by the diene part. Even in case of the oxazole also when you go to the oxazole chemistry; you will see a carbon nitrogen carbon carbon this order now supplied. Now, of course, you can see that 3 is more electron deficient here. That means in these case 3, 4, 5, 6 is the diene part. So, let us say whether we are coming at the right or not. That means this part remains as it is right. And then you will have a double bond this and the which one should the beta carbon; this one is the beta carbon then this is the alpha carbon; and then rest is what E and then E. Now, the double bond should be this one right.

So, nitrogen eliminates. So, if there is if that is so then this one and this is the pyrollidine known and this is E so E and nitrogen eliminates; means you will have diene here diene here right. And then of course, what else thermal elimination would eliminate this

pyrollidine. So, once again you are just a basically extension of the previous example where you all have sorry nitrogen pyridine derivative. So, is a pyridine triester. So, that means just basically I identifying the electron deficient groups atoms one can just and quickly establish this region chemistry of this problem. And whenever you are let us say wanting to form a CNCC skeleton or CC component either you can choose oxazole or you can choose the triagine. And the other examples let us say I think in the last year we gave you this is now so previous example was whether this triagine next was bullet triagine; now this is a digene system.

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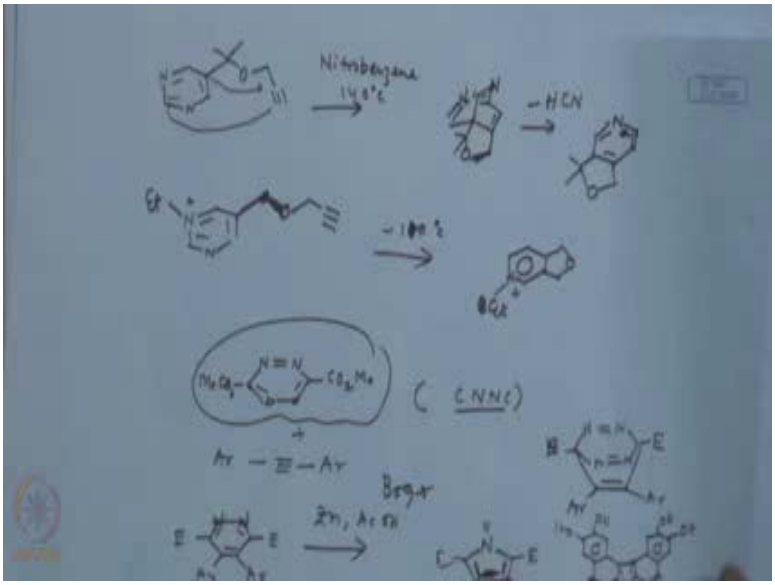

So, digene system in this case it is pyrimidine. Now, whether this reaction would undergo diels alder reaction, what is your guess? We have see triagine case triagines can the reactions proceed very nicely, what about this one? Now, the basically we do not know at least we do not know the pyridine does not undergo diels alder reaction; no, electron deficient pyridine; no, but will see towards the end will see we will see certain way; that means in the extreme case we have see the triagine that means if you a 6 membered ring with 3 nitrogen is sufficiently electron deficient to behave like a diene system fine and now you have a situation.

So, what can I do actually if it is an intramolecular. So, you all know that if either one of this component should be active of more active than the regular once or you have to electron deficiency increase or decreased. And these case and this is a propyl gel group

and nitrobenzene as a solvent. And boiling point of nitrobenzene is around 140 degree centigrade. So, once again what do you see this a nice reaction. The reaction proceeds I mean I can write 2 ways say; like you can write this way that double bond this is the propyl portion oxygen of here; and we have 2 methyl group then 1 nitrogen here, and 1 nitrogen and this right. So, you say that n intermolecular version; how do I write? This is a pretty easy case, because this portion is symmetrically one; you do not have to just think much about identify.

So, 1, 2, 3, 4 that means these ring is reacting here and this ring is reacting here and both are equal symmetrical. Now, also we see that there is a chance of the retro diels alder reactions the 3 different diels alder this here and here. Obviously, it takes place here it starting material and both are equivalent. So, if the reaction takes place on this side is a minus what? HCN. That means, C triple bound N in previous cases we had the loss of nitrogen; in this case we have to HCN. So, HCN so that is lost; then what you will see 1, 2, 3, 4, 5, 6. So, you say again a 6 say pyridine nucleus right. And 1 3 so you have oxygen and this, so you will have this pyridine, so Furo-pyridine ok.

And, this reaction obviously I mean many of you by that if the methyl groups are there actually intramolecular reaction is favour. Because of ((Refer Time: 41:13)) effect actually and then very similar reactions also has been tried just what happens like the; because we have identify this is an electron inverse Diels alder reaction right. And if you do not have the methyl group the reaction either does not take place or is very sluggish. So, what do you do? Let us say you have a situation sorry oxygen and then again a triple bond just the like the previous one just without the methyl group; and the substitutes very similar.

Now, my reactions are very sluggish without the methyl groups because you have only 2 nitrogen electron deficients is not that much. And so you have to increase and but in these case by putting the substituents within the molecular means making it intermolecular version; you have increase the probability of the reaction. But then removing the methyl groups the reactivity is decreased.

So, what basically do then to increase the reactivity they to the substrates. So, that is the reaction takes place at low temperature. And in this particular case the reaction can be carried out at 110 degree centigrade; what else anything? That means, you have to

basically like few minutes ago that you have to make it little electron deficient; that is it that we have to Lewis acid other than the Lewis acid actually in this example what they did? They quaternized this nitrogen that is it, quaternized this nitrogen. And if you do the Diels alder then there is that is this quaternized nitrogen would be lost all asian would be lost. But in these case the Asian is lost; so what we get exactly like the way we got it was the fluoro and fluoropyridine case the ethyl group.

So, what, what next? We have seen triagine; we have seen digene nitrogen pyridine will see towards the end. But let us look at the example where we have tetrazine actually, tetrazine; they which is very popular in the heterocyclic chemistry is a molecule of this kind this symmetrical one nitrogen here and this nitrogen and this is ester. And normally let us say it is a methyl; people some time call say burgess reagent with this one, burgess reagent. So, what is it do is an equivalent to CNC all other cases we have seen the supply CNCC right CNCC. And but the this is an case where it provides only CNC, CNNC that means nitrogen would be eliminated. And this reaction is so clean and neat; just if you let us say if you have triple bond and weak aryl group. Here, you do not have to have a very active alkyl group the reaction nicely takes place.

So, just mix them together just heat and as usual. So, this portion remains as it is and nitrogen, nitrogen and this right and this is E; and then the part of the triple bond this is here; this is Ar and the Ar and then this. Now, in this case as you can see that retro Diels alder can takes place either at this nitrogen pair or this nitrogen pair does not matter, because both are equivalent. So, eventually what you will get? This is Ar, Ar and this case this is E, E and E; and nitrogen, nitrogen what is this derivative? 2 nitrogen at 1 1 2 position. What is the name? 1 3 is pyrimidine.

Student: ((Refer Time: 46:22))

Good, pyridazin. And if 1 4 is pyrazine. So, you get tetra substituted that means is fully substituted pyrogen. And difficulty in these case I mean such a reaction is very important because to functionalize the heterocyclization all carbons is very difficult. Because one substitution is no problem, second substitution ortho position it creates lot of steric hindrance right.

Then, one more steric hindrance like here we have lot of steric hindrance and the group here normally is a bulky especially in the contest of national product synthesis. So, this is

only Diels alder can little bit of the steric reactions, what next? That means a tetragene can be maid use in the Diels alder reaction to produce tetragene derivative that is not all; actually once upon a time I think I told you is a very clean reaction. If you react with zinc and acetic acid you will get something; what is it?

Student: ((Refer Time: 47:43))

It gives actually pyrroles. So, pyrrole; so this actually known as bogar ring contraction the same bogar actually ring contraction. So, eventually what you will get? You will get a pyrrole ring. So, Ar sorry to day I have something happening here, so and this E is a nice reaction group; and the reagent is very cheap zinc and acetic acid. So, just simply reduce this and you get tetra substituted pyrrole.

And, this has been used in synthesizing quite a few national products one that is synthesized; I think just very briefly I will write the structure. It is something like this; it is even more little more complex, but you have something like; so you have I mean very similar pattern on this side. And so that means so again this is an example of how to make use of the heterocycles. And this has tetragene but how do you make this tetragene any idea, any guess, random guess? Just by looking at the structure how do you make it? In fact, I was not before I mean of course, now I know.

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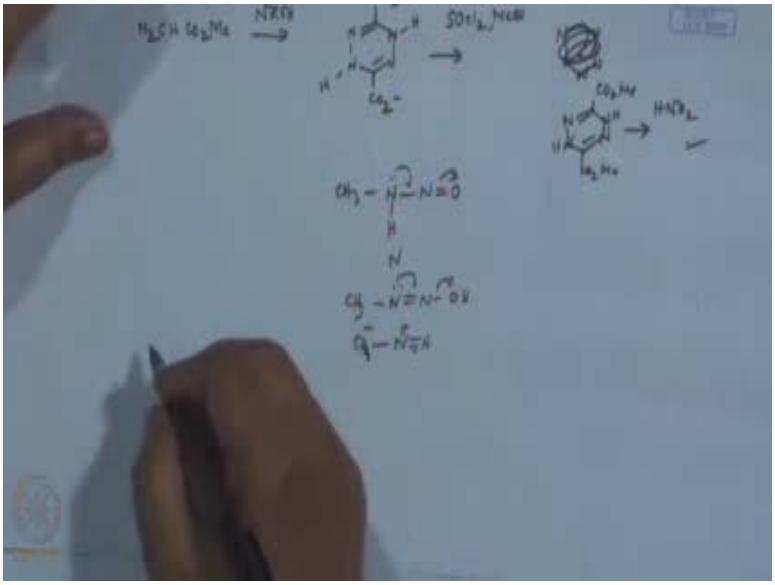


I think will begin with let us say how do you make this compound methyl diazoacetate? How do you make?

Student: ((Refer Time: 50:17))

Biosin, right. So, methyl biosin or sodium nitrate in all other case diazo compounds are unstable. But if you have an electron withdrawing group or conjugate system ((Refer Time: 50:27)). Then if you heat just warm with sodium hydroxide; actually sodium hydroxide what you will get? You will get this tetragene, but in the tetragene and so tetragene salt and this one this compound you can just do little manipulation. Basically, many of you probably know that the CH is sufficiently active it can be deprotonated by a base even with LDA ((Refer Time: 51:02)) or other thing this can be deprotonated and then undergo the dimerization or cyclocondensation you can say. What is to be done next? Next is as just as it is chloride and methanol; and so you will get corresponding methyl ester and this NH and NH. And then I think all of know what we done what next? You have to remove 2 hydrogens.

So, basically you have to do dehydrogen. So, how do you do the dehydrogenation? So, you have to basically look for so of the reagents quinone or quinone would not do the reaction. Because all of us know quinone with quinone and NH that is the that those are the limitations. For example, DDQ etcetera are known to undergo whether known to induce the oscillations or dehydrogenations. But when it comes to the nitrogen compound then you have some reputations. Because nitrogen can undergo micro addition, nitrogen undergo displacement all these things are reactions; there is a reactions again indoor synthesis is called endothermic reaction. So, will their nitrogen acts to the quina nitrogen sorry quionone; nitrogen acts to the quionone carbonyl.

So, all these things takes place. And so you have to have other normally the palladium carbon is one of the cheapset kind of reagent. But in these case the that has been recommended is something like simple nitrous acid that gives you the reaction that is gives you the product nitrous acid also is an oxydising it. And.

Student: ((Refer Time: 53:23))

Which reaction?

Student: ((Refer Time: 53:27))

Whenever you said…

Student: It not the preparation for the ((Refer Time: 53:34))

But it is not though; I mean obviously it is not. But I am trying to recall actually; normally they require an amide either a sulphonamide or that kind of thing.

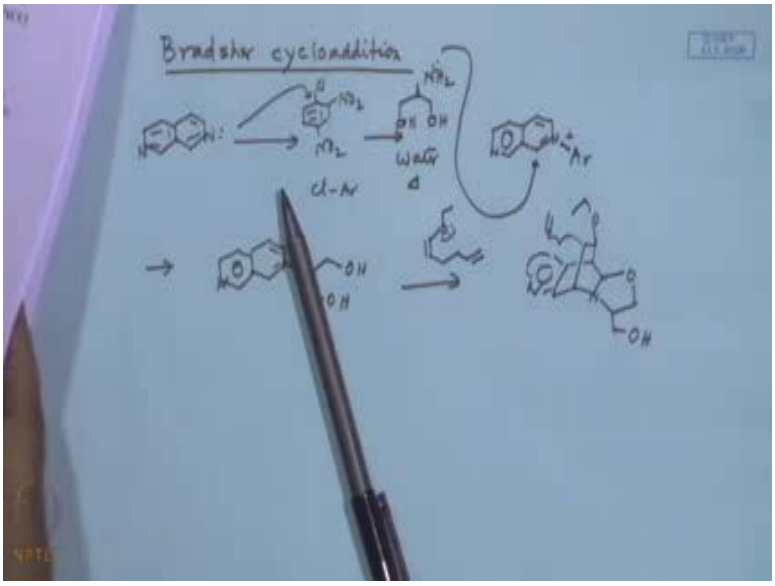
Student: ((Refer Time: 54:02))

Not an ester say diazomethane normally I mean like say; how do I say? Let us say if have ((Refer Time: 54:20)) is like compound of this kind; N H you know this set of compound you have to have so…

Student: ((Refer Time: 54:36))

Anything should be there and I mean you can go; on basically, but it does not form that is sure. I mean the most of the then you get these it was N, OH and CH 3. Then further it goes. So, we get this one once you have these automatically O this OH. Actually, abstract the proton and you get this diazomethane. So, essential that means nitrous methyl urea if you reuse then it cannot undergoes; that means this and a then I think we have many other examples probably. I think I will be able one more important reaction very quickly.

(Refer Slide Time: 55:36)



This is a reaction you may have to read little bit by yourself is a very useful again say known as Bradsher cycloaddition reactions. So, long we had talked about we those pyridazine and this is basic pyridazine and triagine tetragene; all these things are whenever talked about this pyridine kind of a nucleus. But if the pyridine nucleus is part of a bicyclic system in this case you will see here even as a isocolon derivative. And this nitrogen and you first trade this with these dinitrochlorobenzene. And then very interesting reaction though I do not know whether you should be able to predict the product or not. Then you seen amino alcohol and just put them in water and heat. So, what do you product of you expect?

Student: ((Refer Time: 57:01))

If product actually, what is happening here? I will just tell you quaternization of nitrogen. What quaternization of nitrogen? We have seen that before right in zinc salt in the prepration of the zinc salt. So, and once it is quaternise in one side, the other side remains as it is. So, then what? Let us say I will write Ar let us say this is chlorine and Ar; what next? Zinc salt undergoes ring opening. If you recall is undergoes ring opening? Now, you have substrate here, and between amino and OH all of us know which one is more nucleophilic?

Student: ((Refer Time: 57:54))

Amino is more nucleophilic. So, it will undergo nucleophilic all these things opening; and then recyclization eventually what you will get? You will get this one; this a nice reaction, very nice reaction. That means, sorry dinitrochlorobenzene has only activate the nucleus eventually this has this is plus now.

So, nitrogen of has been replaced by the nucleophilic nitrogen of the reactant; that is not all the reaction. That we are about to talk about is this one. You have is a double bonded compound. Now, we can see between if again we are talking about Diels alder kind of reaction; you have an olefin of here say methoxy olefin means the electron electronically activated, because of the lonepair of the oxygen. So, it is electron dreach dienophile and in this case the this one is the dienophile the pyridine nucleus dienophile. So, this reaction that would take place and give the product; just one minute this one. And you have this side chain then you have this pyridine nucleus; and oxygen this and probably this OH.

So, what is the lesson? The lesson is that this olefin component reacts and the even that means even with a single nitrogen we can expect Diels alder reaction provided sufficiently activated by cotranisation. And this and then you undergo cycloaddition. And eventually we can go on other plenty of examples may be what I will do group of 2 any 2 on group you chosen one group do this home work very quickly; give me send me a ppt or all file with camera right all of you have the camera you just write down the reference. And just right down the reference; 1983 jacks page number some of you not all I will give you 1, 2, 3 references. So, you just divide among yourself.