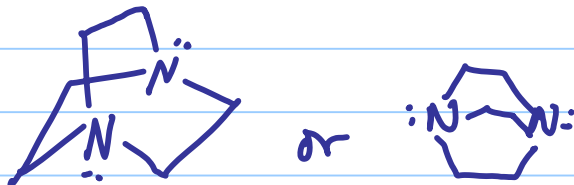
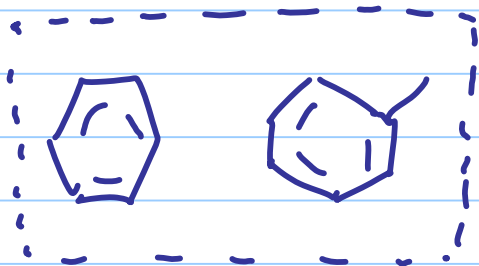


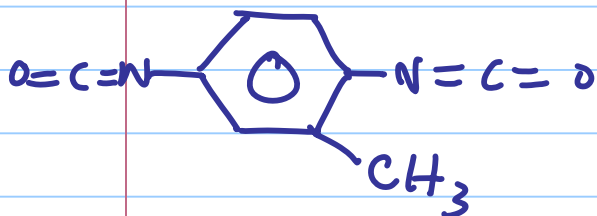
* Polyurethanes - begin with components

Note Title

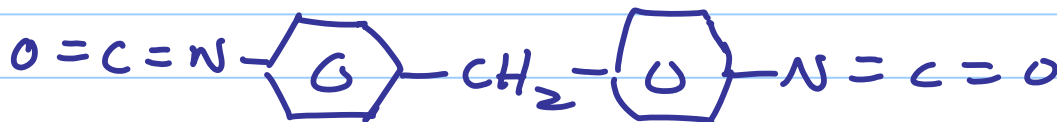
9/27/2007



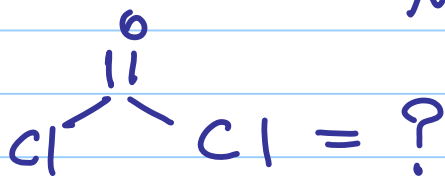
diazabicyclo (2.2.2) octane
DABCO



= Toluene diisocyanate
TDI



MDI =



* Ref: Stevens & Wiki

History: polyurethane was invented in 1937 in Germany to get around Dupont's nylon patent.

Not commercially available until 1950's

I am as old as polyurethane foam!

1969: All-plastic car - facilitated by urethanes and Reaction Injection Molding.

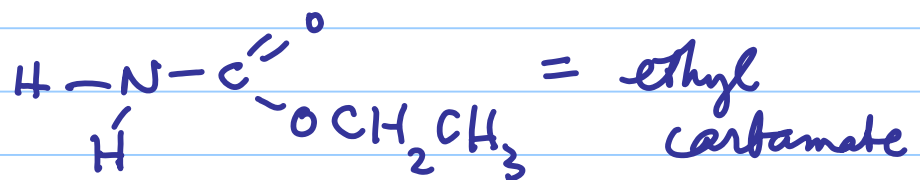
Now we have RRIM = reinforced RIM: fibers are injected with the polymer to produce the first plastic body car in the US (Pontiac Fiero).

Water blown foam = insulation, glue

OK - So what IS a polyurethane.

First, semantics

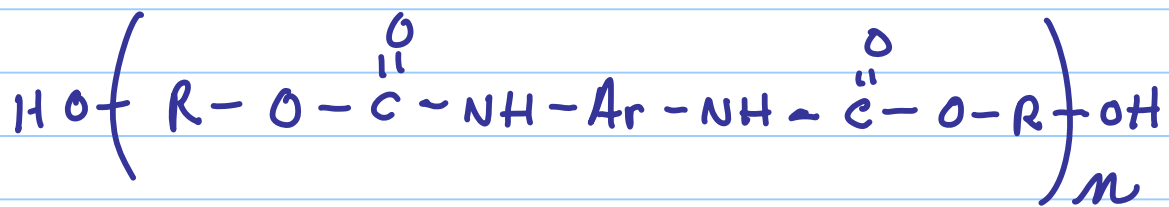
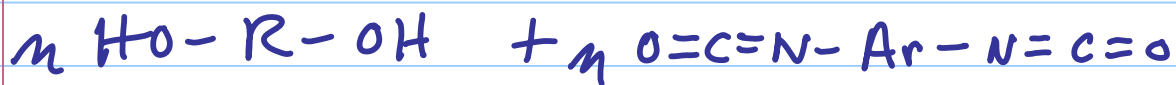
"ethyl carbamate" = "urethane"



but often called urethane

polyurethane is not poly (ethyl carbamate)

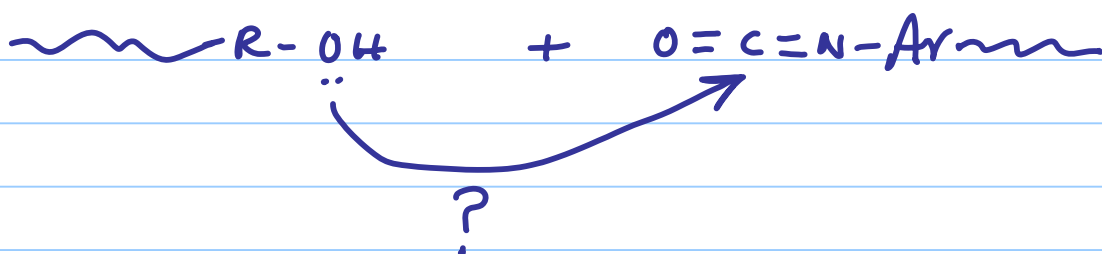
PU's best thought of as the result of
diol & di-isocyanate rxn.




Note: is it an addition or condensation?

What MW & kinetics do we expect?

Try to push the electrons

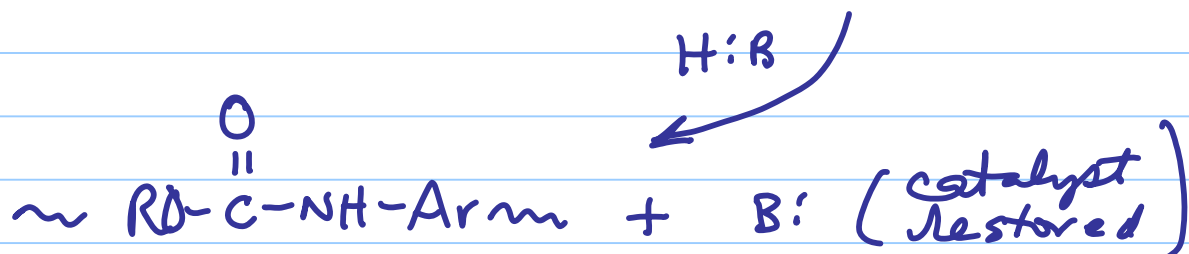
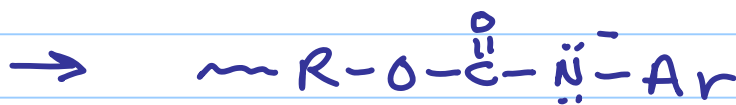


well, yes, but not necessarily fast

let's add DABCO  \equiv :B

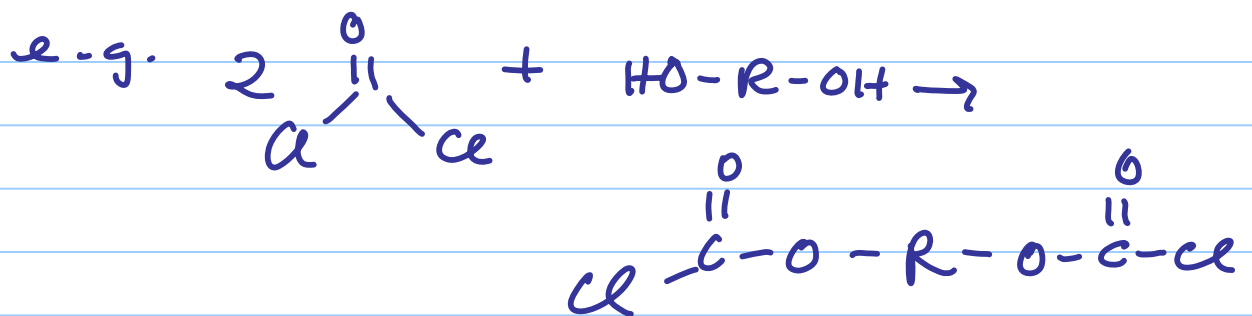


Then $\text{~RO}^- + \text{O=C=N-Ar~}$



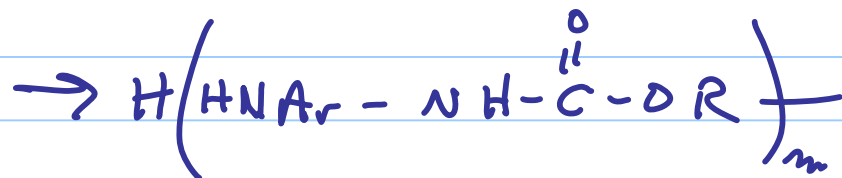
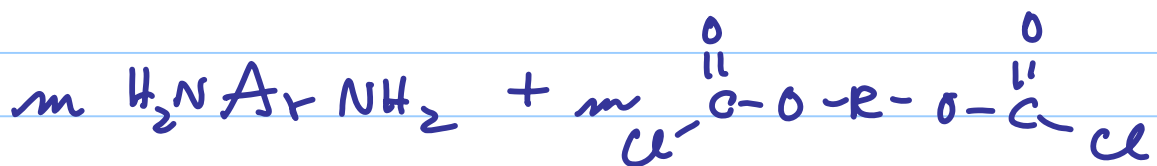
Diol + di-isocyanate
is one way to make a linear PU.

You can also do it by making a
chloroformate & reacting it to
a diamine.



BTW: dangerous phosgene was also
involved in the diol + diisocyanate approach -
Can you see where?

Then



"But That's not all" Cat in The Hat

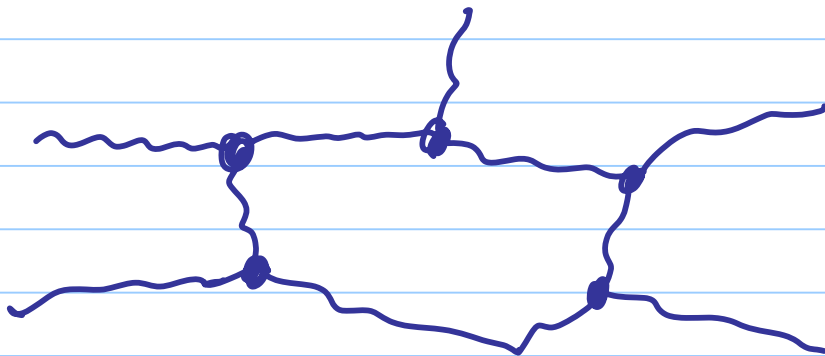


Consider spiking a diol + di
mixture with some glycerol



{ let's write it as
'cuz any triol will do } OCC(O)O

So... I will get crosslinks



I guess that solves the low-M problem!

"But wait, There's more." Ron Popeil

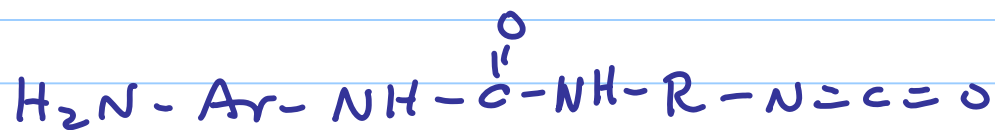
What happens if water is added to a diol + di prep?

water does nothing to the diol

water reacts to the di-iso



The diamine can react w/ some remaining di-isocyanate, so polymerization can continue



a urea link

The cool thing is the out-gassing CO_2 gets trapped by the increasingly viscous polymer and you get a FOAM!

"But wait, There's even more."

- production of various diols
- surfactants to alter/control foam
- addition of reinforcing agents
- colorants
- penetrating agents (coatings)

