



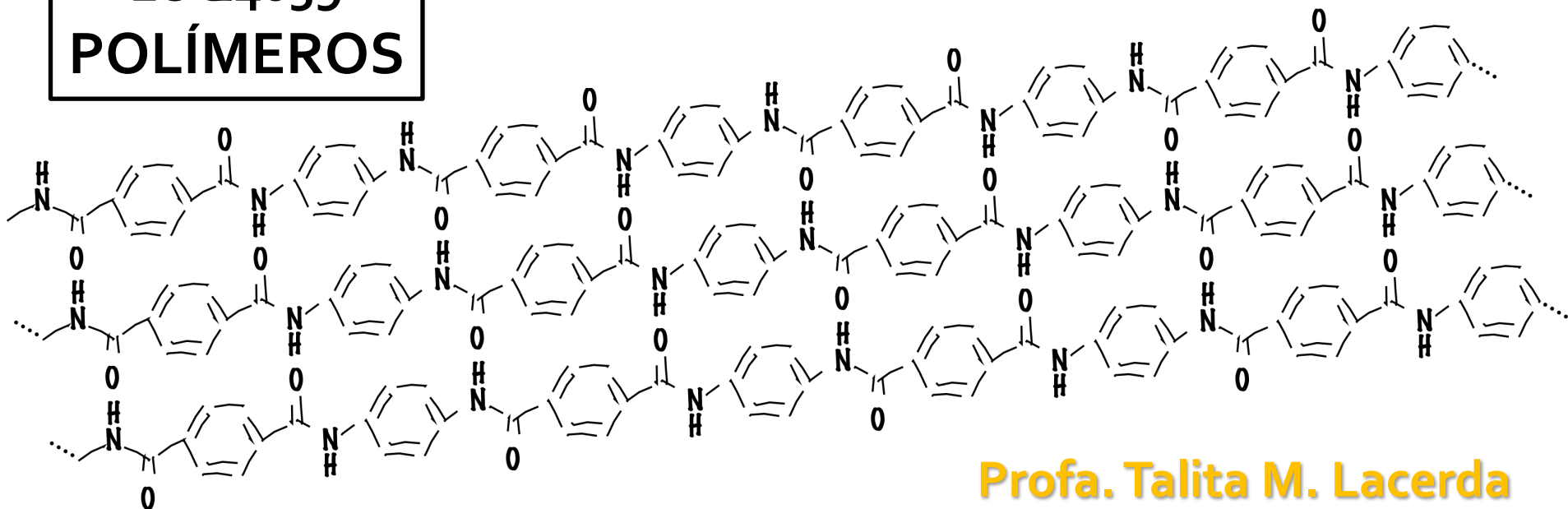
# UNIVERSIDADE DE SÃO PAULO

## ESCOLA DE ENGENHARIA DE LORENA

### DEPARTAMENTO DE BIOTECNOLOGIA



LOQ4059  
POLÍMEROS



**Profa. Talita M. Lacerda**

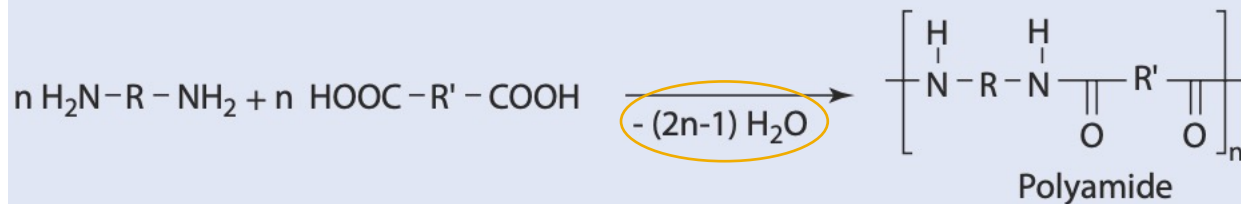
*Laboratório de Biopolímeros, Biorreatores e Simulação de Processos (LBBSim)*

Departamento de Biotecnologia, Escola de Engenharia de Lorena

[talitalacerda@usp.br](mailto:talitalacerda@usp.br)

Polímeros podem ser classificados de acordo com as reações a partir das quais são obtidos:

1. **Polímeros de condensação (crescimento em etapas)**
2. Polímeros de adição (crescimento em cadeia)



Reação direta  
entre grupos  
funcionais

*a cadeia cresce "aos saltos" (em etapas) – nome faz referência à cinética de polimerização*

**POLIAMIDAS**

**POLICARBONATOS**

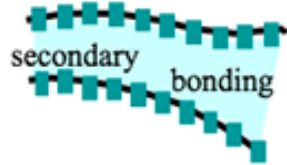
**POLIÉSTERES**

**POLIURETANAS**

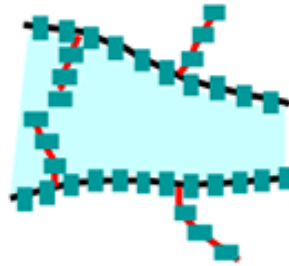
**RESINAS**

# RESINAS

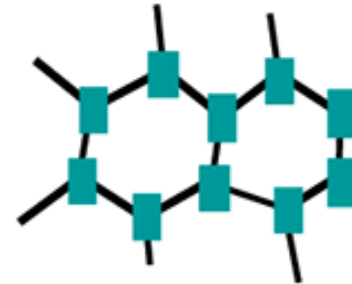
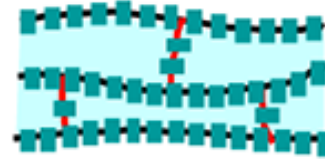
Resinas epóxi – Resinas amínicas – Termorrígidos fenólicos



*polímeros lineares*

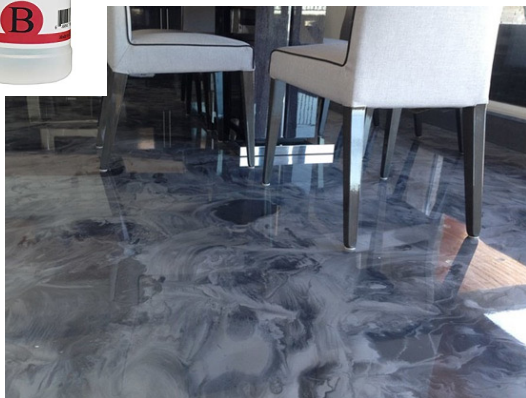


*polímeros ramificados*



*polímeros entrecruzados*

# RESINAS



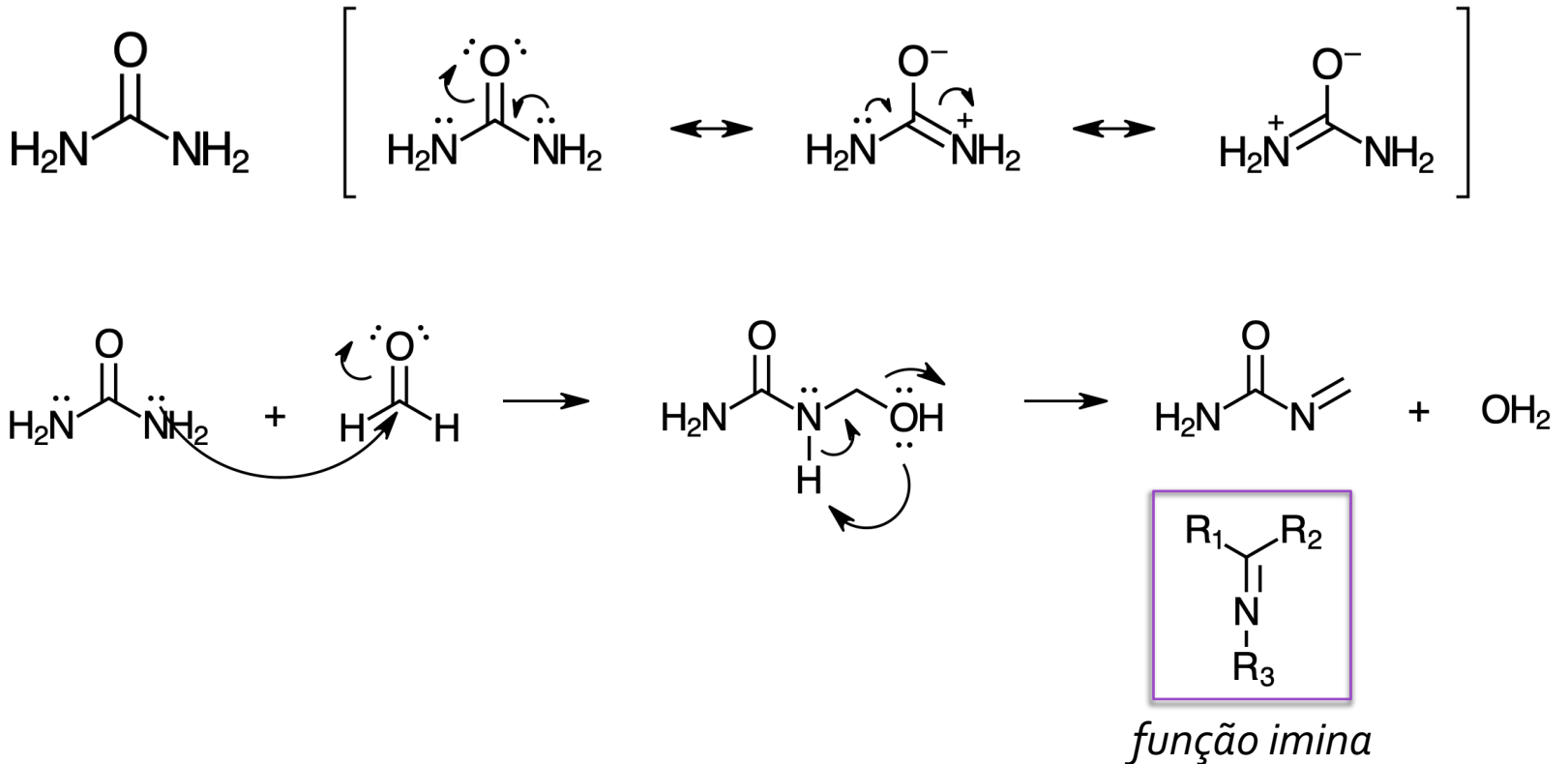
# RESINAS

Resinas epóxi – Resinas amínicas – Termorrígidos fenólicos

uréia/formaldeído

melamina/formaldeído

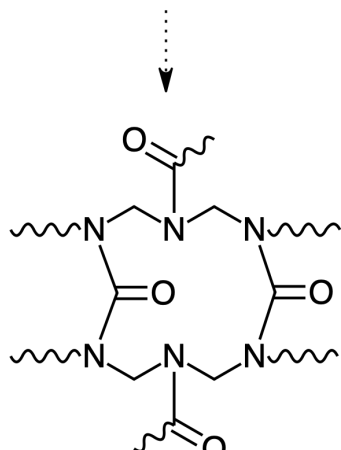
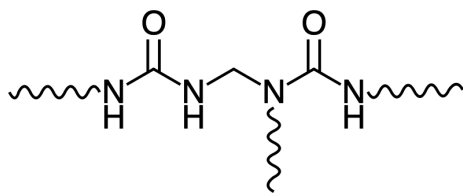
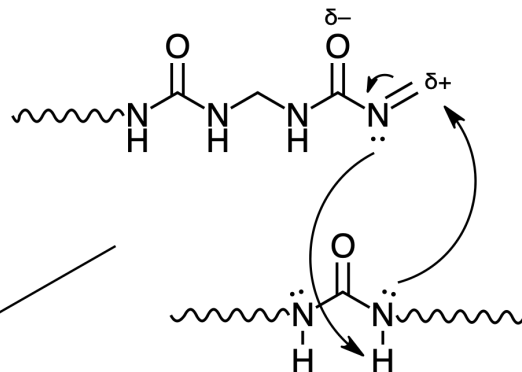
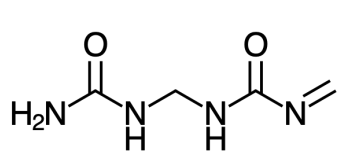
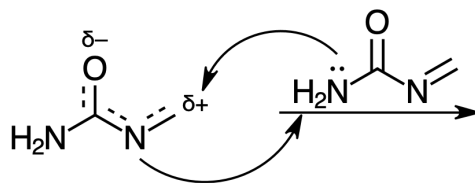
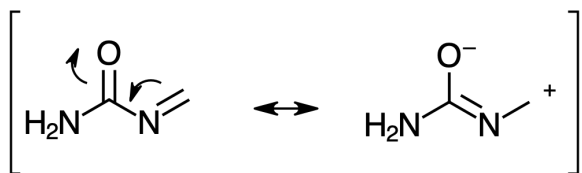
reação entre formaldeído e reagentes com 2 ou 3 grupos  $-NH_2$



# RESINAS

Resinas epóxi – Resinas amínicas – Termorrígidos fenólicos

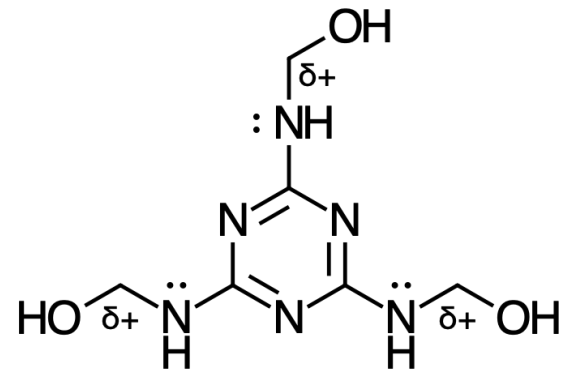
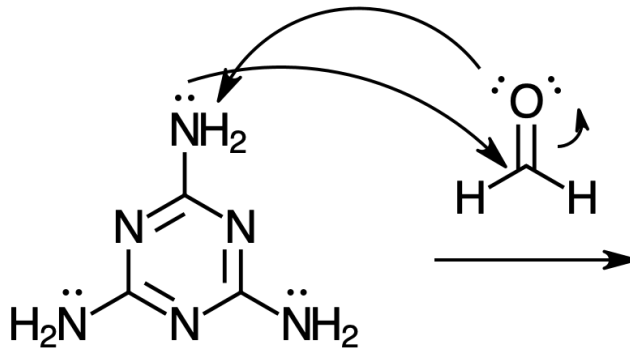
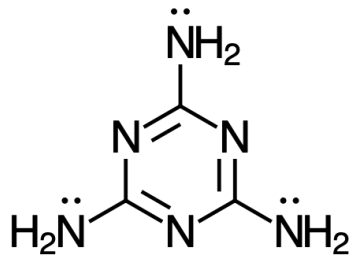
uréia/formaldeído



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reação entre formaldeído e reagentes com 2 ou 3 grupos  $-NH_2$



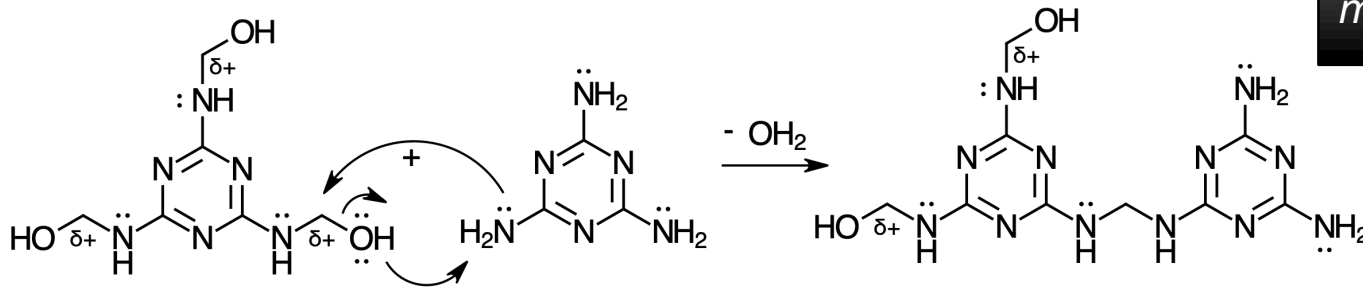
*uréia/formaldeído*

*melamina/formaldeído*

# RESINAS

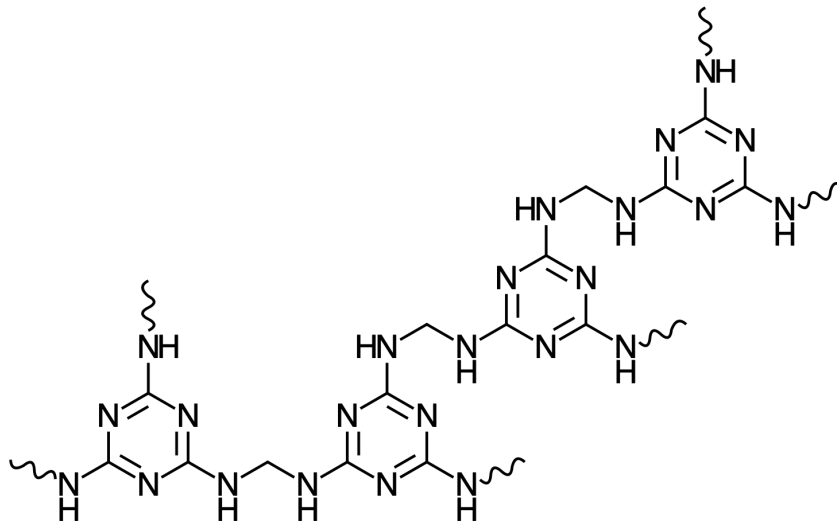
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reação entre formaldeído e reagentes com 2 ou 3 grupos  $-NH_2$



uréia/formaldeído

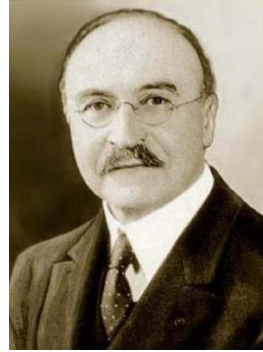
melamina/formaldeído



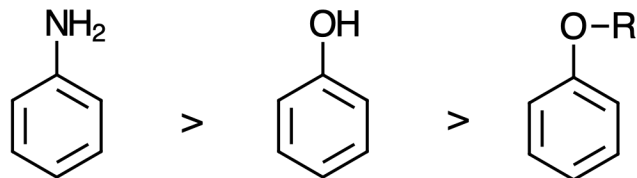
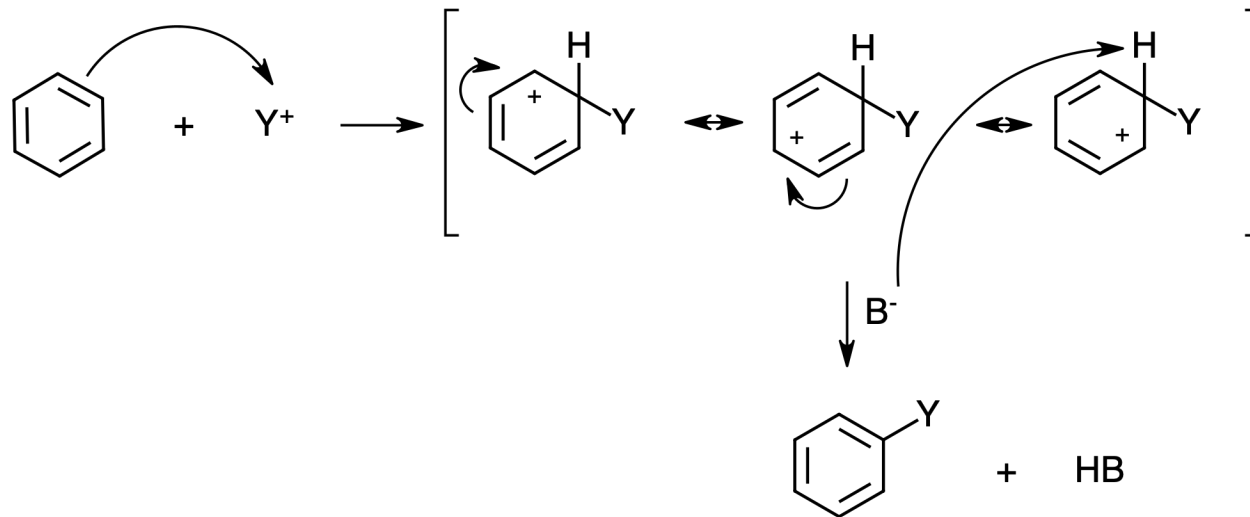
# RESINAS

## Resinas epóxi – Resinas amínicas – Termorrígidos fenólicos

*fenol + formaldeído (Leo Baekeland, 1900)*



*Antes, precisamos falar de: reações de substituição eletrofílica no anel aromático*

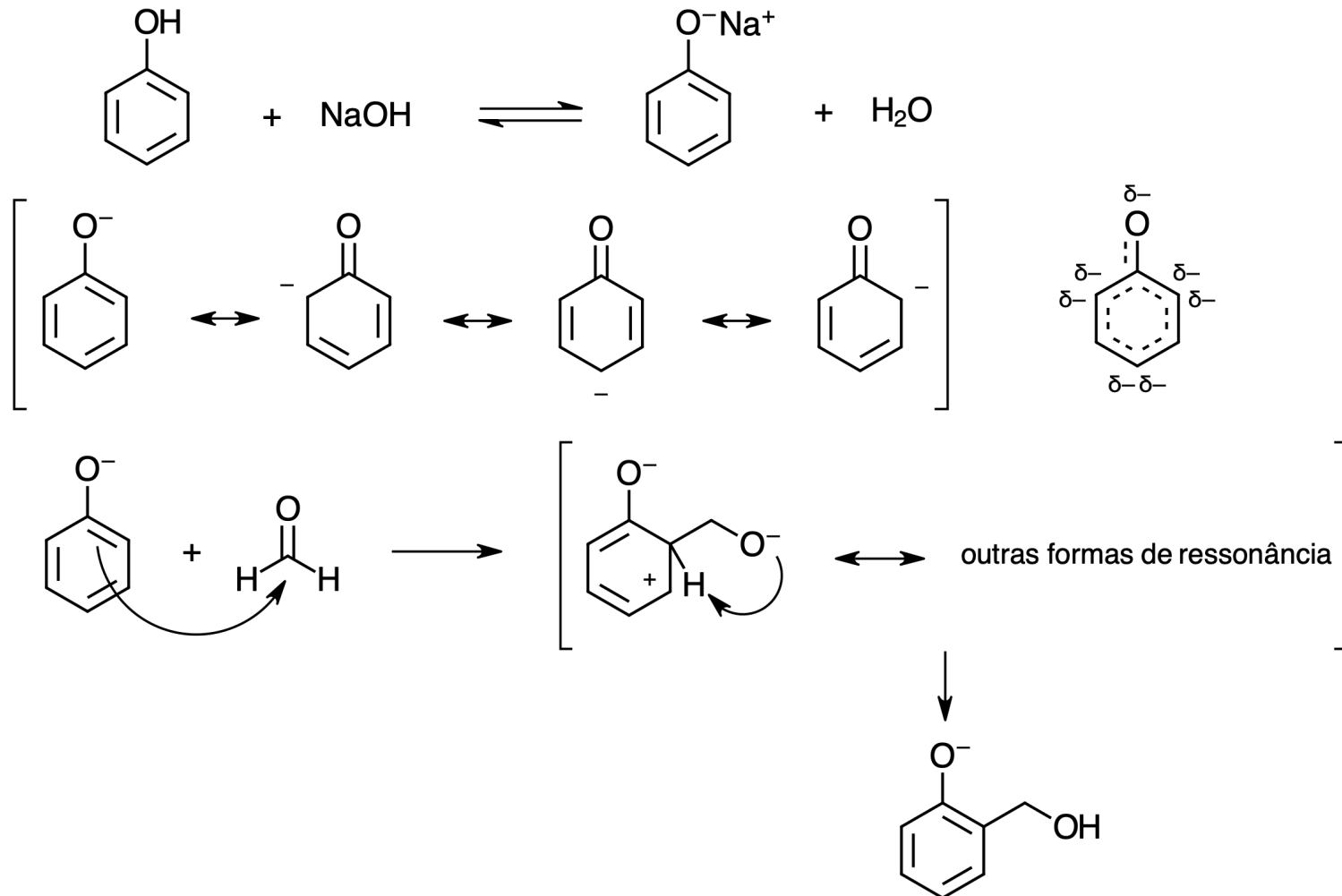




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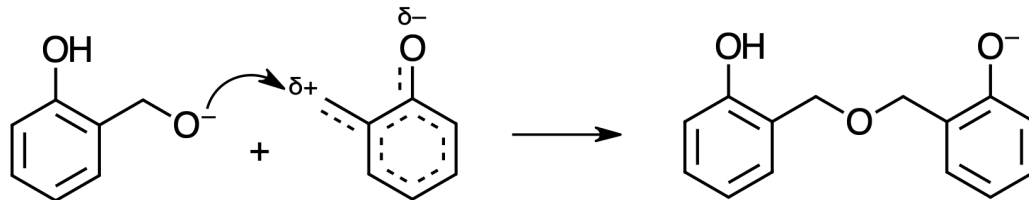
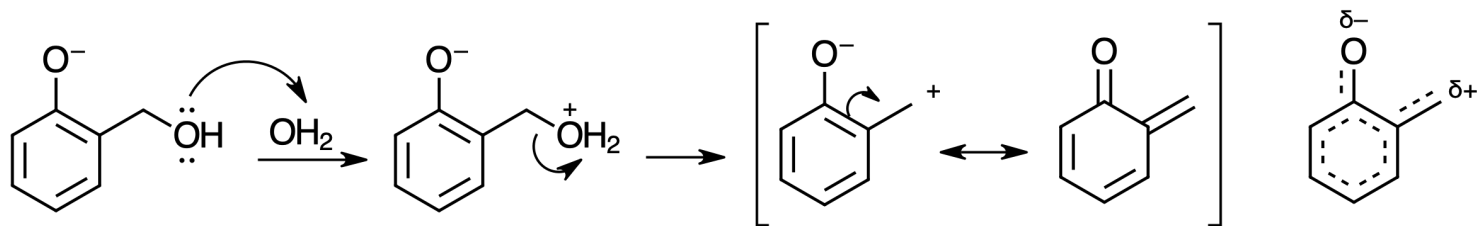
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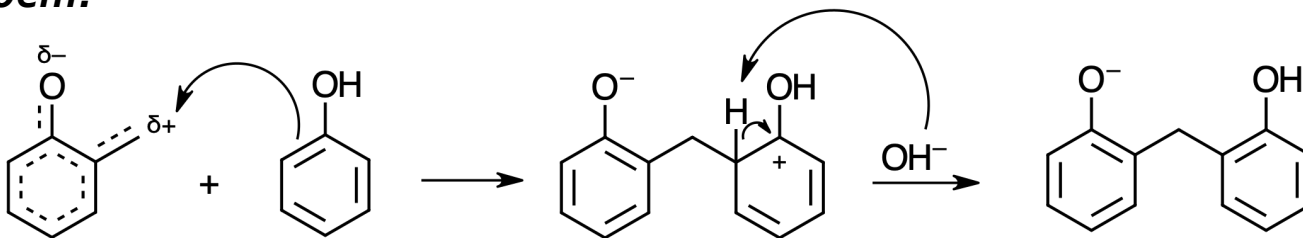
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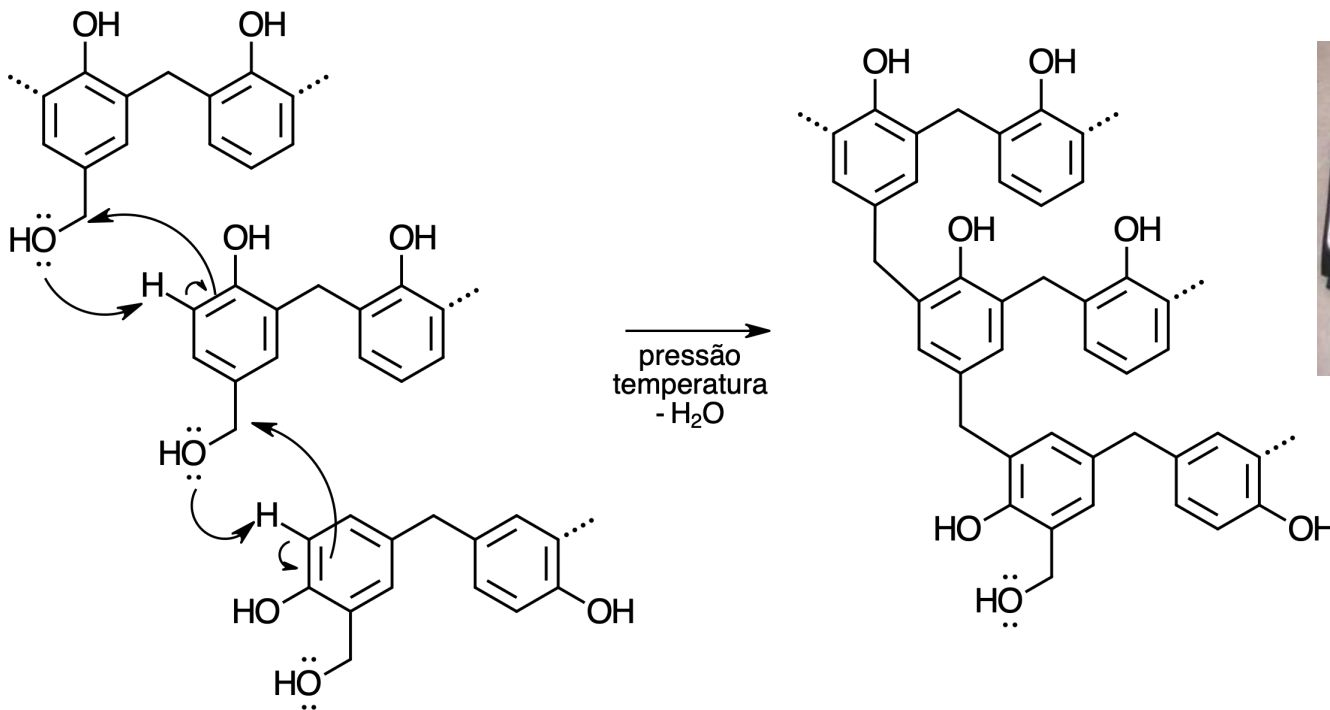
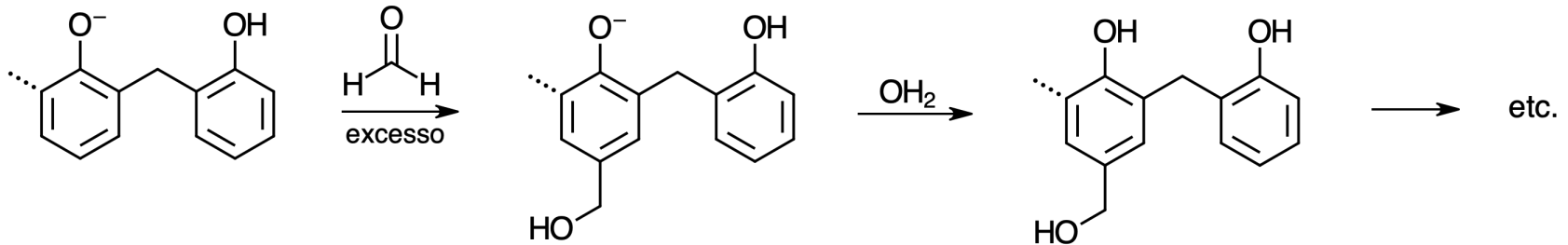


***e também:***



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