

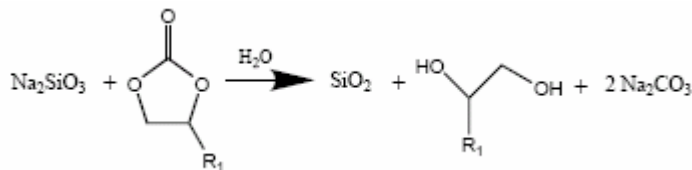
## Technical Bulletin

# JEFFSOL<sup>®</sup> ALKYLENE CARBONATES AS CURE ACCELERATORS

JEFFSOL<sup>®</sup> Alkylene Carbonates have found utility in numerous industries and applications. There are two major types of cure acceleration reactions in which JEFFSOL<sup>®</sup> Alkylene Carbonates may be used. These are silicate (foundry sand) binding and phenol formaldehyde resins.

### FOUNDRY SAND BINDING

Silicate cure acceleration is used in the foundry sand binding industry as a form of “sand reclamation” as taught by US Patent #4,416,694, granted to Foseco International Ltd.<sup>1</sup> The reaction below illustrates the reaction of the alkylene carbonate with the sodium silicate and water to form “water glass” (gel), glycol, and sodium carbonate.



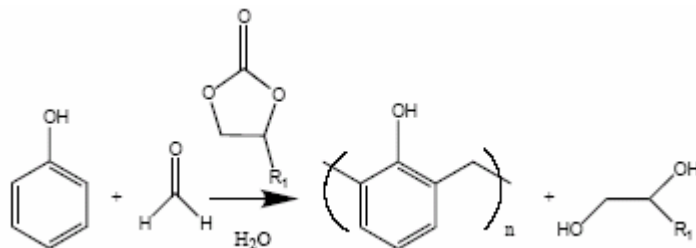
The SiO<sub>2</sub> polymerizes to form “water-glass” at gel point.

- R<sub>1</sub> = H (JEFFSOL<sup>®</sup> Ethylene Carbonate)
- = CH<sub>3</sub> (JEFFSOL<sup>®</sup> Propylene Carbonate)
- = C<sub>2</sub>H<sub>5</sub> (JEFFSOL<sup>®</sup> Butylene Carbonate)

One may control the rate of reaction (cure) by changing the selection or ratio of alkylene carbonates. One may slow down the cure by choosing a substituted alkylene carbonate such as JEFFSOL<sup>®</sup> Butylene Carbonate, or speed up the rate of cure by adding less hindered JEFFSOL<sup>®</sup> Propylene Carbonate, or unsubstituted JEFFSOL<sup>®</sup> Ethylene Carbonate.

### PHENOL FORMALDEHYDE RESINS

Numerous patents and literature articles have been written teaching the use of alkylene carbonates in phenol formaldehyde resins. These resins find utility in a number of markets. One such market, which has been thoroughly studied, is the lumber market where alkylene carbonates are used as cure accelerators in the manufacture of wood products using phenol formaldehyde resins.<sup>2,3</sup> The reaction below depicts the reaction of alkylene carbonates and the role they play in cure acceleration.



- R<sub>1</sub> = H (JEFFSOL<sup>®</sup> Ethylene Carbonate)
- = CH<sub>3</sub> (JEFFSOL<sup>®</sup> Propylene Carbonate)
- = C<sub>2</sub>H<sub>5</sub> (JEFFSOL<sup>®</sup> Butylene Carbonate)

This technology may find utility in all types of phenol formaldehyde resins including resorcinol formaldehyde and novolac resins. References to patent documents on the reverse side are provided as background information only, and should not be construed as a suggestion to make, use or sell any invention claimed therein without authorization from the patent owner.

References to patent documents below are provided as background information only, and should not be construed as a suggestion to make, use or sell any invention claimed therein without authorization from the patent owner.

**References**

- <sup>1</sup> U.S. Patent 4,416,694 to Foseco International Limited, England, Nov. 22, 1983.
- <sup>2</sup> Byung-Dae Park; Bernard Riedl; Journal of Applied Polymer Sci., Vol. 77, 841-851 (2000)
- <sup>3</sup> A. Pizzi; A. Stephanou; Journal of Applied Polymer Sci., Vol. 49, 2157-2170 (1993)

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