CRAY VALLEY
Resins par excellence

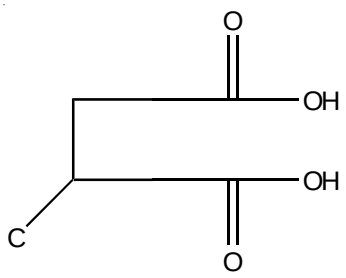
APPLICATION BULLETIN

Ricobonds®: Why Do They Adhere? Adhesion Mechanisms

Adhesion to Polar Surfaces

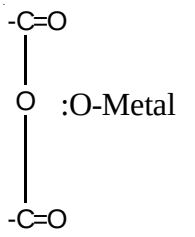
Many rubber adhesives contain a polar functional group such as an acrylate, cyanoacrylate, or carboxylic acid. These functional groups are "electron rich" and can form an electrostatic bond with a positively charged polar group on the surface of a substrate such as a metal, similarly, PBD-MA contains a succinic ring that can open to form dicarboxylic functionality.

Conjugation within the polybutadiene molecule leads to electronic resonance that further enhances the spread of electronic charge and leads to additional ability to interact with polar surfaces.



Metallic salt formation can be initiated between the carboxylic functionality and iron ions on the surface of a steel surface for example.

The formation of oxide films on the surface of a metal can lead to further interaction with the PBD-MA.



A lower energy system; more stable

In the case of a metal where the oxide is tightly bound to the metal (for example in the case of aluminum) this bond can be very effective. If the oxide easily flakes away from the metal (as in the case of zinc for example), the PBD-MA is effective in interacting with the oxide film but the film itself is easily shed and overall bonding is not as effective.

Adhesion to Nonpolar Surfaces

Several mechanisms may play a role in the formation of a bond to a nonpolar surface such as that associated with polyolefins for example. As a long string of polybutadiene lines up on the surface of a high crystallized material such as polyethylene, the interatomic distances become small enough for Van der Waals attractions to become significant. Entanglement also likely plays a role. Peptating rubber groups on the surface of a rubber substrate lead to entanglement of the PBD string which positions the two polymers for further interaction in the vulcanization process. This latter process involves the formation of chemical bonds.

The dicarboxylic functionality of ring opened PBD-MA can interact with absorbed water and oxygen through electrostatic interactions.

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