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Surface Modification of Poly(dimethylsiloxane) with 254 nm Irradiation: A Comparison of Functional Groups

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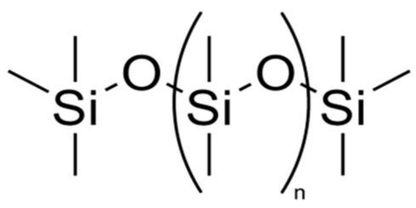
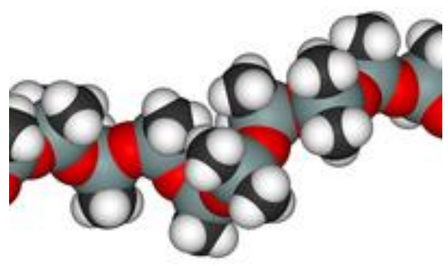
Overview

Poly(dimethylsiloxane) (PDMS) is a relevant polymer in studying the interface between a solid and a liquid. When modified, PDMS can present with different functional groups. Studying the retained surface modification of PDMS is useful in the fields of electronics encapsulation, fuel cell applications, and shielding. This work lays the foundation for the promotion of adhesion between PDMS and other surfaces.



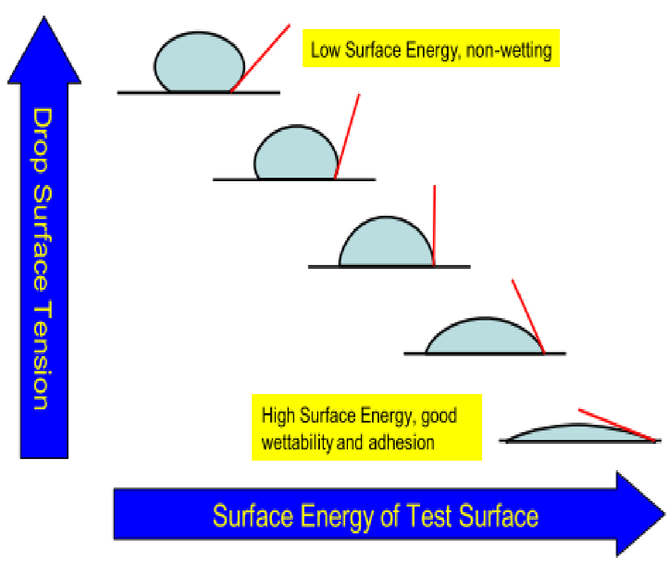
Properties of PDMS

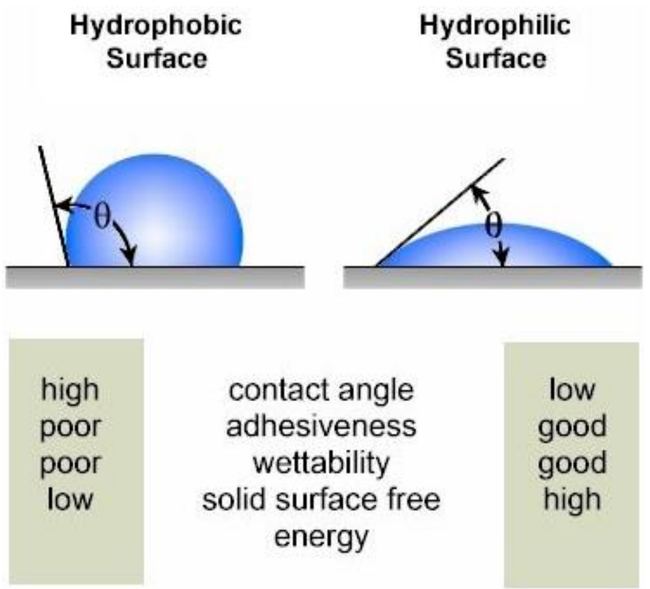
Chemically Inert	Optically transparent	Permeable to gases
Self-releasing		Low T_g
Low M_w	Seals readily	Non-toxic

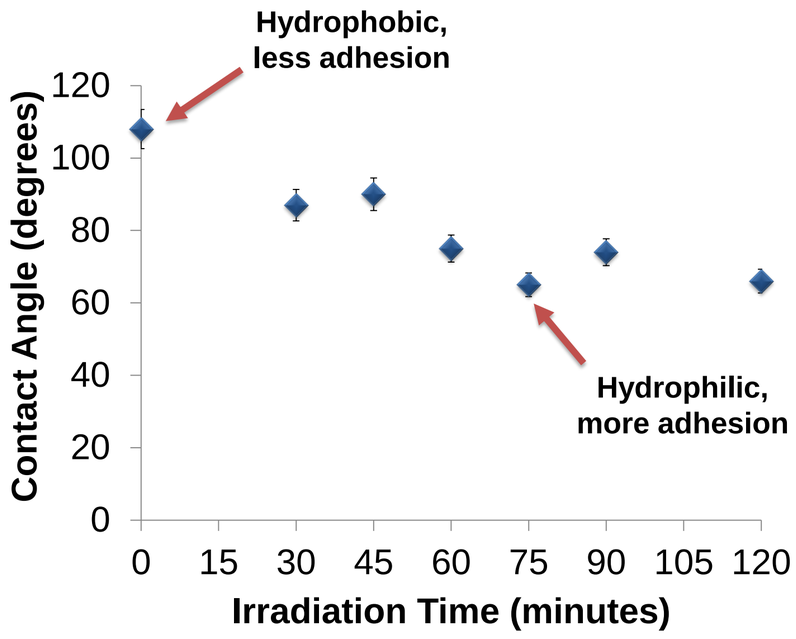


Key Findings

Contact Angle is indicative of the ability to promote adhesion between PDMS and new surfaces.







Explanation

The retention of modified chemical bonds on the surface of PDMS is relevant in many fields and applications. Polymer composites such as modified PDMS can be designed to perform better than Al for shielding space radiation. Low carbon content of silicones compared to highly carbonaceous resin systems such as polyamides, and urethanes, makes PDMS an ideal candidate for high temperature sophisticated applications such as acting as a heat tile on reentry space vehicles.

Impact

The major reason for the use of a PDMS-based adhesive system in space shuttles is due to its unique characteristics. In strategic applications like space shuttles the thermal protection system is bonded to the metal framework of the vehicle by silicone-based adhesives. In space vehicles, PDMS-based adhesives have a wide range of applications such as adhesion of silica thermal protection tile, strain isolation pad to space shuttle, heat sinks to printed circuit boards, etc.

Acknowledgement

Dr. Emanuel Waddell:, Surface Science Group, UAHuntsville Department of Chemistry