

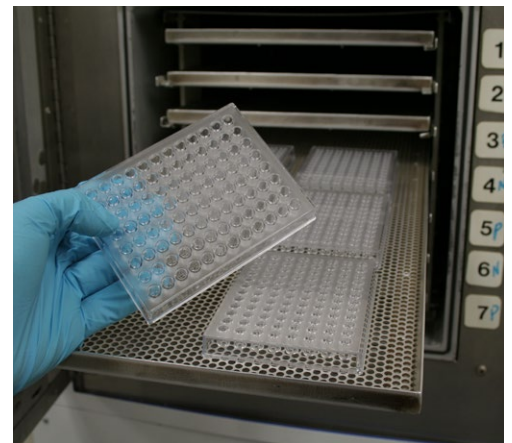


## Using Plasma to Increase Adhesion on Polycarbonate

A study was conducted at TriStar's [Enhanced Materials Division](#) to examine the relative differences in bond strength between untreated polycarbonate (PC), mechanically-roughened PC, and plasma-treated PC.

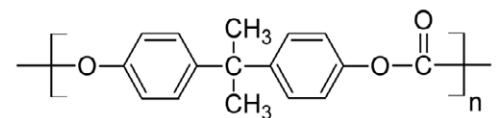
The study proved that treating the PC with [vacuum plasma](#) (as opposed to open-air plasma treatments like corona treating) prior to bonding, lamination, or overmolding, yielded the highest potential for maximum bond-strength with a 459% increase in lap shear testing.

A plasma is a quasi-neutral cloud of ionized gas (basically free ions, electrons, and radicals) that is capable of rearranging surface molecules on the PC substrate to increase hydrophilicity (wettability) and produce chemical bond sites onto which adhesive may graft.



	Material: Polycarbonate		
	Untreated	Mechanically Roughened	Plasma Treatment
Contact Angle	98 deg.	64 deg.	14 deg.
Pull Strength	113.5 psi	211.7 psi	634.3
Extension	0.0264 in.	0.0335 in.	0.0779 in.
Failure Mode	Adhesion (delamination)	Adhesion (material break)	Adhesion (delamination)

Polycarbonates are in a specific category of thermoplastics. They are called polycarbonates because they are polymers possessing functional groups linked together by carbonate groups in a long molecular chain. The most common type of PC is one made from Bisphenol A (see molecule image at right). This type of PC is transparent to visible light; in fact, it has better light transmission characteristics than many types of glass.



PC can be mechanically bonded by several standard methods. It can be cemented by using a solvent such as methylene chloride, or by conventional adhesives such as epoxy, urethanes, and silicones; however, solvent based adhesives can contaminate sensitive devices, so care should be taken when applying an adhesive. PC may also be ultrasonically welded – but ultrasonic welding requires tight tolerances and smooth contaminate-free surfaces.

Plasma treating the PC prior to bonding with common adhesives may still be the most effective, uniform, repeatable, and environmentally-friendly method of preparing the PC without the need for solvent-based adhesives or technically-difficult ultrasonic welding.

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- 54,400 PSI Compressive Strength
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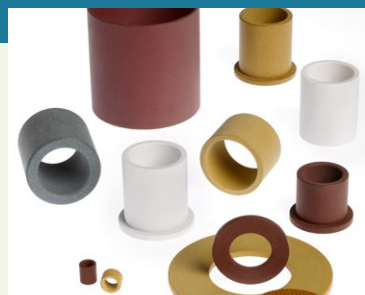
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