



Plasma Treating to Promote Adhesion on Rulon® J

This study examined the relative adhesion difference between untreated Rulon J and plasma treated Rulon J. It appears that plasma surface modification of Rulon based polymers is a viable way to enhance adhesion prior to bond-up, lamination, or overmolding. This study observed approximately a 117% increase in lap shear bond strength after plasma treatment.

[Rulon](#) is an engineered tetrafluoroethylene polymer mixed with other materials; polymeric or inorganic. Since a portion of the Rulon material is a fluorocarbon polymer, it is difficult to achieve good lap shear bond strength without some sort of surface treatment. Sodium naphthalene ammonia dips or liquid etching of fluorocarbons are an effective way to enhance the adhesion of fluorocarbon polymers. But, this highly caustic and toxic method is dangerous and can be difficult to control. Moreover, the resulting surface of a dipped material is discolored to brown or black. [Plasma surface modification](#) is as effective as this dip method yet it is environmentally friendly, safe, controllable and repeatable without discoloration.

Plasma is a quasi-neutral cloud of ion, electrons, and radicals. The diffuse cloud is capable of doing chemistry on the surface of materials that is unique, providing wettable or adherent surfaces on materials that are otherwise inert. The [Rulon J](#) samples in this study were subjected to a specific plasma gas mixture to induce and adherent surface for a structural epoxy adhesive. The results are as follows:

	Material: Rulon J	
	Untreated	Treated
Contact Angle	110 deg.	80 deg.
Pull Strength	45.9 psi	100.0 psi
Extension	1.23 in.	6.35 in.
Failure Mode	Adhesion (delimitation)	Substrate (material break)

It is important to note that the maximum pull strength of the treated sample was compromised by the deformation of the test specimen (see figure 1).

In summary, it is difficult to achieve strong lap shear bond strengths on fluoropolymers. Traditional surface preparation methods are dangerous and discolor the material. By using plasma surface modification, the bond strength has improved by approximately 117% without discoloration.



[Figure 1] – The Rulon J sample on the left was subjected to plasma treatment and bonded.

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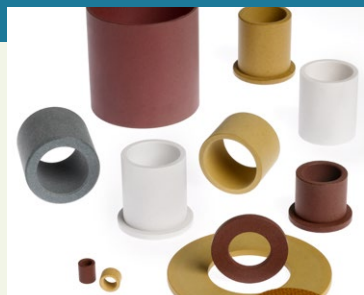
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