

Genestar™

High Voltage Applications

GENESTAR™ is a brand name of heat resistant polyamide developed by Kuraray.

GENESTAR™ PA9T series in that brand is a well-balanced long-chain polyphthalamide (PPA) that combines low water absorption and high mechanical properties over a broad temperature range.

The focus of the automotive industry is shifted more and more towards electric vehicles and the development in this field has sped up tremendously. One of the major challenges is to increase the driving range. Automotive manufacturers have been putting their efforts towards higher voltages amongst others. Up to date, electric cars use battery voltage levels of 300 to 400V. Porsche Taycan is taking advantage of an 800V battery. Next to higher voltages, there is also weight reduction and part miniaturization which leads to higher efficiency. However, combining the need for higher voltages and smaller parts may result in a higher risk of failure due to electric breakdown.

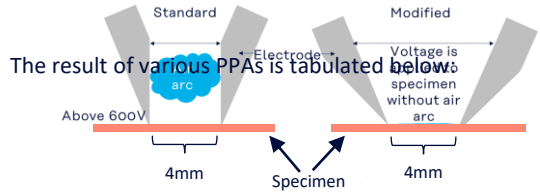
Electrical breakdown generated by tracking (base material becomes conductive) arises when an electrical path is formed due to the degradation of the surface of the insulating material. This is translated into a material's comparative tracking index (CTI). The minimum creepage distance is specified in IEC 60664-1 and it depends on the CTI of the material. The highest class under this standard is 600V, but questions whether 600V is the limit of a material pop up.

With this information, the scientists of Kuraray developed a material that exhibits CTI > 600V. However, this material is believed to have better performances at even higher voltage applications. Based on IEC 60112 test method, a partial breakdown in air was observed when the testing voltage was ramped up to 625V, even though there was no tracking path observed on the test specimen. Therefore, the scientists of Kuraray rotated the electrode 180°.

This resulted in a higher clearance between the electrodes and the test voltage could be ramped up to even higher voltages without a discharge in air.



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The result of various PPAs is tabulated below

Voltage (V)	Material group	Material	Material	Voltage(V)
>600	I	PPA	PA9T-GF45 FR(*1)	950
400-599	II	PPS	PA6T/66-GF30 FR	825
175-399	IIIa	PPS, LCP	PA4T-GF30 FR	750
100-174	IIIb		PA9T-GF35(*2)	775
IEC 60664-1			PA4T-GF30	600
			PA6T-GF30	600
			PA9T-GF45	600
			GENESTAR™ G1350A	600

Through this evaluation, it is concluded that GENESTAR™ is able to withstand a higher CTI than many competitive materials (both V0 or HB flammability rating). GENESTAR™ can be used for replacement of connectors where current materials (LCP, PPS) are not able to meet CTI requirements.

GENESTAR™ can also be used for motor insulation parts and insulated-gate bipolar transistor (IGBT) among many other high voltage applications.



If the information in this article is of interest to you, please find the contact details below to get in touch with us.

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