STRENGTH+ STIFFNESS

HIGH MODULUS CARBON FIBER REINFORCED LNP™ THERMOCOMP™ AND LUBRICOMP™ COMPOUNDS

High performance compounds for structural healthcare applications

CHEMISTRY THAT MATTERS™

SABIC

Founded in 1976, SABIC is today the first public, global multinational enterprise headquartered in the Middle East. Our products range from bulk commodity chemicals to highly engineered plastics for demanding applications. We are a leading producer of polyethylene, polypropylene, glycols, methanol and fertilizers and the world's third largest polyolefin producer.

SABIC's offerings include Chemicals, Polymers, Specialties, Agri-Nutrients and Metals. In Saudi Arabia, the Netherlands, Spain, the USA, India, China and Japan, our dedicated Technology & Innovation centers research ways to meet our customers' needs with excellence.

INNOVATING FOR CUSTOMER SUCCESS

We believe that SABIC customers deserve the full benefit of every advantage our enterprise can offer. After all, our success is defined by our customers' success. And with more than 80 years of experience pioneering advanced engineering thermoplastics, SABIC is positioned to help create new opportunities for growth and breakthrough applications.

We offer expertise and experience to our customers in a variety of ways:

- Material solutions to help drive innovation and market leadership.
- Design, logistics and processing expertise to spark new ideas and better efficiencies.
- Unwavering commitment to build long-term relationships with ingenuity, trust and continuous improvement.

It's what we strive for and work to deliver… a mutual benefit.

Excellence and nothing less.

HIGHER STANDARDS...

Through our innovative use of high modulus carbon fiber technology that is creatively compounded with high performance resins, SABIC has developed two new compounds which have shown significant improvement in stiffness versus similar compounds with standard carbon fiber technology.

Medical devices and the materials used to construct them must withstand ever increasing in-service demands due to more complex designs, performance requirements and regulations. In particular, the heightened emphasis on system cost optimization, weight reduction, high strength and stiffness as well as an increasing need to be compatible with use in MRI systems is driving material suppliers to develop innovative thermoplastic solutions to meet these emerging challenges to replace metals.

These innovative materials may enable medical device manufacturers to expand their use of injection moldable engineered thermoplastics to replace metal or other fiber filled thermoplastics.

...PROVIDE AN OPPORTUNITY TO SOLVE TOUGH DESIGN PROBLEMS

Among the family of high performance engineered thermoplastic compounds offered by SABIC to help healthcare device manufacturers meet these challenges are two new, high modulus carbon fiber reinforced solutions.

LNP THERMOCOMP EC006AQW COMPOUND

LNP THERMOCOMP EC006AQW compound is a high modulus carbon fiber reinforced PEI resin, an excellent candidate material for demanding applications which require high strength and stiffness, excellent chemical compatibility and mechanical stability in repeated, harsh sterilization environments. Potential applications may include either disposable or re-usable surgical instruments, fixation devices, patient transport devices, medical device housings and other components and hardware where metals have been used.

TABLE 1 – PROPERTIES OF LNP THERMOCOMP EC006AQW COMPOUND

TYPICAL PROPERTIES[1]	TYPICAL VALUE	UNIT	STANDARD
MECHANICAL			
Flexural Modulus, 2 mm/min	23300	MPa	ASTM D 790
Flexural Stress, break	367	MPa	ASTM D 790
Tensile Modulus, 5 mm/min	28660	MPa	ASTM D 638
Tensile Stress, break	265	MPa	ASTM D 638
Tensile Strain, break	1.75	%	ASTM D 638
Compressive Strength	234	MPa	SABIC Method
IMPACT			
Izod Impact, notched, 23 °C	90	J/m	ASTM D 256
Izod Impact, unnotched, 23 °C	761	J/m	ASTM D 256
THERMAL			
HDT, 1.82 MPa, 3.2 mm	198	°C	ASTM D 648
PHYSICAL			
Specific Gravity	1.39	—	ASTM D 792
Mold Shrinkage, flow	0.03 – 0.10	%	ASTM D 955
Mold Shrinkage, xflow	0.1 – 0.6	%	ASTM D 955
PROCESSING PARAMETERS			
INJECTION MOLDING			
Drying Temperature	120 – 150	°C	
Drying Time	4	hrs	
Maximum Moisture Content	0.02	%	
Front- Zone 3 Temperature	390 – 400	°C	
Middle- Zone 2 Temperature	390 – 400	°C	
Rear- Zone 1 Temperature	390 – 400	°C	
Mold Temperature	165 – 180	°C	
Screw Speed	50 – 100	rpm	
Back Pressure	0.3 – 0.7	MPa	
Injection Speed	40 – 70	mm/s	
Cooling time	30 - 50	s	

[1)] Typical values only. Variations within normal tolerances are possible for various colors. All values are measured at least after 48 hours storage at 23°C/50% relative humidity. All properties, expect the melt volume rate are measured on injection molded samples. All samples are prepared according to ISO 294.

LNP LUBRICOMP DCI06APW COMPOUND

LNP LUBRICOMP DCI06APW compound combines the benefits of high modulus carbon fiber with a unique high flow, ductile polycarbonate for demanding applications which require high strength and stiffness, internal lubrication and good processability, enabling a balance between design flexibility and manufacturability in disposable medical devices. Potential applications may include disposable surgical instruments, medical device housings and other components where the use of metals or other stiff thermoplastics with poor flow can create design and manufacturing challenges.

TABLE 2 – PROPERTIES OF LNP LUBRICOMP DCI06APW COMPOUND

TYPICAL PROPERTIES[1]	TYPICAL VALUE	UNIT	STANDARD
MECHANICAL			
Flexural Modulus, 2 mm/min	20640	MPa	ASTM D 790
Flexural Stress, break	260	MPa	ASTM D 790
Tensile Modulus, 5 mm/min	23500	MPa	ASTM D 638
Tensile Stress, break	190	MPa	ASTM D 638
Tensile Strain, break	1.5	%	ASTM D 638
Shear Modulus	3508	MPa	ASTM D 732
Shear Strength	92	MPa	ASTM D 732
Compressive Strength	128	MPa	SABIC Method
IMPACT			
Izod Impact, notched, 23 °C	115	J/m	ASTM D 256
Izod Impact, unnotched, 23 °C	670	J/m	ASTM D 256
Instrumented Impact Total Energy, 23 °C	16.8	J	ASTM D 3763
THERMAL			
HDT, 1.82 MPa, 3.2 mm	128	°C	ASTM D 648
CTE, -40 °C to 40 °C, flow	9.7 E-6	1/ °C	ASTM E 831
CTE, -40 °C to 40 °C, xflow	4.6 E-5	1/ °C	ASTM E 831
ELECTRICAL			
Surface resistivity	1E+3 – 1E+4	Ohm/sq	ASTM D 257
PHYSICAL			
Specific Gravity	1.30	—	ASTM D 792
Water Absorption, 24 hrs	0.11	%	ASTM D 570
Mold Shrinkage, flow	0.05 – 0.15	%	ASTM D 955
Mold Shrinkage, xflow	0.15 – 0.40	%	ASTM D 955
FLOW			
MVR, 300 °C, 5 Kg	28	cm^3/10 min	ASTM D1238
PROCESSING PARAMETERS			
INJECTION MOLDING			
Drying Temperature	120	°C	
Drying Time	4	Hrs	
Maximum Moisture Content	0.02	%	
Front- Zone 3 Temperature	285 – 300	°C	
Middle- Zone 2 Temperature	285 – 300	°C	
Rear- Zone 1 Temperature	285 – 300	°C	
Mold Temperature	100 – 120	°C	
Screw Speed	40 – 80	rpm	
Back Pressure	0.2 – 0.3	MPa	

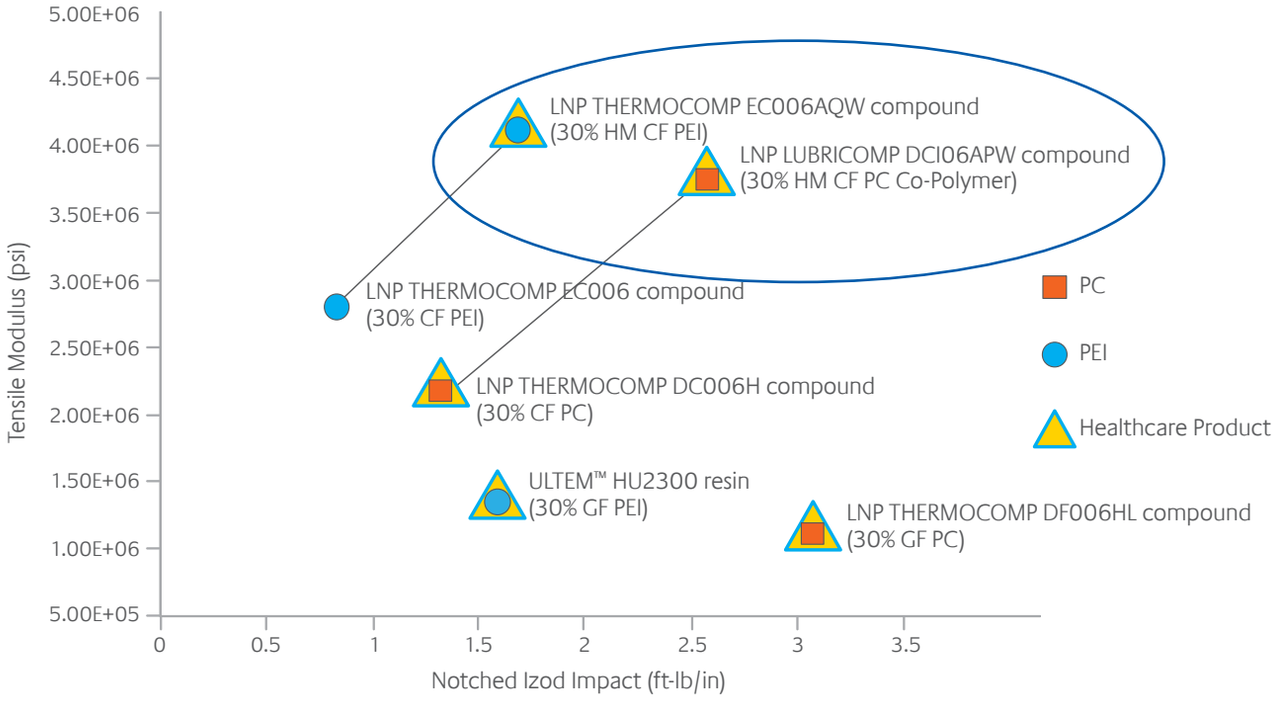
[1] Typical values only. Variations within normal tolerances are possible for various colors. All values are measured at least after 48 hours storage at 23°C/50% relative humidity. All properties, expect the melt volume rate are measured on injection molded samples. All samples are prepared according to ISO 294.

PRODUCT SELECTION

IMPROVED PERFORMANCE OF SABIC'S CARBON FIBER REINFORCED LNP THERMOCOMP AND LUBRICOMP COMPOUNDS

Both LNP THERMOCOMP EC006AQW and LNP LUBRICOMP DCI06APW compounds represent a significant increase in both tensile modulus and impact strength versus standard carbon fiber and glass reinforced thermoplastics as shown in Figure 1.

FIGURE 1 – COMPARISON OF LNP THERMOCOMP EC006AQW AND LNP LUBRICOMP DCI06APW COMPOUNDS



KEY:

HM CF = High Modulus Carbon Fiber

CF = Standard Modulus Carbon Fiber

GF = Glass Fiber

IMPLANT POLICY

SABIC does not knowingly support or provide resin for applications that remain implanted beyond 29 days.

RESIN BIOCOMPATIBILITY

LNP LUBRICOMP DCI06APW compound and LNP THERMOCOMP EC006AQW compound have been pre-assessed and passed the material related tests from the ISO 10993 "Biological Evaluation of Medical Devices".

SABIC does not knowingly support the use of grades not designated as "biocompatible" in healthcare applications requiring biocompatibility.

While these two new LNP compounds both demonstrate significant increases in strength and stiffness than existing fiber-filled compounds, it is important to consider the broad set of application requirements when choosing a material. Table 3 provides a qualitative comparison of several other key criteria which may be factors to consider in material selection.

TABLE 3 – RELATIVE PROPERTIES OF LNP HIGH MODULUS CARBON-FIBER COMPOUNDS

GENERIC PERFORMANCE CRITERIA*	LNP THERMOCOMP EC006AQW COMPOUND	LNP LUBRICOMP DCI06APW COMPOUND
Chemical Resistance	++	–
Sterilization Stability	++	+
Processability	+	++
Modulus	++	+
Strength	+	++
Notched Izod Impact	++	+
Heat Resistance	++	+

* "++" = excellent, "+" = good, "–" = marginal

CONTACT US

Middle East and Africa

SABIC Global Headquarters
PO Box 5101
Riyadh 11422
Saudi Arabia
T +966 (0) 1 225 8000
F +966 (0) 1 225 9000
E info@sabic.com

Americas

2500 CityWest Boulevard
Suite 100
Houston, Texas 77042
USA
T +1 713 430-2301
E productinquiries@sabic.com

Technical Answer Center
T +1 800 845 0600

Europe

Plasticslaan 1
PO Box 117
4600 AC
Bergen op Zoom
The Netherlands
T +31 164 292911
F +31 164 292940

Technical Answer Center
T (0) 0 800 1 238 5060
T2 00 36 1 238 5060
E webinquiries@sabic.com

Asia Pacific

2550 Xiupu Road
Pudong
201319 Shanghai
China
T +86 21 2037 8188
F +86 21 2037 8288