EASTMAN

Resist flex fatigue.
Increase headband durability.

Headphones and other wearable devices require durability and toughness. This includes chemical resistance to body oils, cleaners, and other chemicals.

Headbands present a particularly challenging application because of the repeated flex stress cycles and the constant exposure to body oils, hair products, cleaners, and even food.

FLEX FATIGUE TESTING

Eastman has conducted controlled flex fatigue tests on Eastman Tritan™ TX1001 copolyester, polycarbonate, and amorphous nylon (nylon 12). All material samples were subjected to ~5% strain[1] for repeated flex cycles using recognized cyclic flex methods. Each specimen was tested to failure, and the number of cycles was recorded (Figure 1).

CHEMICAL RESISTANCE TESTING

Environmental stress cracking (ESC) is the major contributor to plastic parts failure—especially those under repeated stress or impact.[2] Portable and wearable electronics such as headphones tend to be at higher risk for ESC due to the chemicals and levels of stress they are exposed to.

Table 1 compares the compatibility of Tritan and other polymers with common chemicals that frequently contact headbands. Tritan performed significantly better than competitive materials.

FIGURE 1. Average cycles to failure

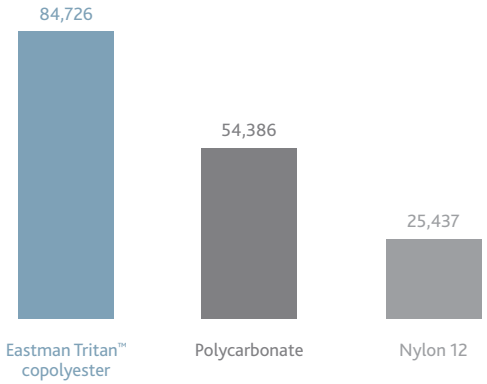

TABLE 1. Chemical resistance

		Retention in impact energy (%)			
	Description	Eastman Tritan™ copolyester TX1001	Polycarbonate	PC/ABS	Nylon 12
Human interface	Sebum (skin oil)	●	◔	◑	◕
	Artificial sweat	●	●	●	◕
	Mayonnaise	●	◕	◔	◕
Cleaners	Clorox® wipes	●	◔	◔	●
	Windex®	●	◕	●	●
	Formula 409® cleaner	●	●	●	●
	70% IPA	●	●	◔	◕
Hair products	Morrocanoil® dry shampoo	●	◔	●	●
	Hairspray	●	◔	◔	●

Property retention based on reverse-side impact test method after 24 hours of strain exposure

- ● *80% to 100%*
- ◕ *60% to 80%*
- ◑ *30% to 60%*
- ◔ *0% to 30%*

[1]*Strain of 5% is commonly used in FFU testing because it is compatible with the 95th percentile of all heads.*
[2]*Polypropylene Definitive User's Guide and Databook, Plastics Design Library. New York, U.S.A. 1998.*

Eastman **TRITAN**™
copolyester

Combine acoustic performance with flex resistance.

Eastman Tritan™ copolyester offers a unique combination of performance characteristics that make it ideal for portable and wearable electronics:

- Outstanding toughness and flex fatigue resilience
- Lasting good looks and color retention
- Made without bisphenols, styrenics, halogens, or any of the other 850+ materials of concern listed in California Proposition 65 (Prop 65)
- Excellent impact strength and resistance to environmental stress cracking (ESC)
- Best-in-class chemical resistance, including sweat and skin oils, lotions, and hygienic cleaners
- Design flexibility with excellent properties for processing and secondary operations
- Outstanding acoustic performance evaluated in private and collaborative testing

Most importantly, Tritan is backed by Eastman polymer expertise and technical support.

READY TO HEAR MORE?

For more test results, videos, webinars, and reference guides, visit www.eastman.com/Consumer-Electronics.

EASTMAN
The results of **insight**™

Eastman Corporate Headquarters
P.O. Box 431
Kingsport, TN 37662-5280 U.S.A.

U.S.A. and Canada, 800-EASTMAN (800-327-8626)
Other Locations, +(1) 423-229-2000

www.eastman.com/locations

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