SmartNotes

Q&A

How does an engineered polymer rotor impact the operation and maintenance of a microcentrifuge?

Microcentrifuges are critical to both life science research and clinical diagnostic applications and the rotor selection can impact the safety and productivity of these high-use instruments. By selecting engineered polymer (polypropylene) rotors, these lightweight rotors may reduce separation run time with a faster acceleration/deceleration and as a result, may consume less energy. Additionally, lowering inertia may increase safety by minimizing the risk of damage in the event of a rotor failure. Enhanced chemical resistance properties may also protect the rotor from corrosion, compared to traditional aluminum rotors, even when using a bleaching agent for cleaning purposes.

Thermo Scientific™ microcentrifuges with polypropylene rotor

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Why is polypropylene a good material for microcentrifuge rotors?

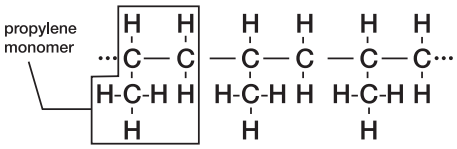
What is polypropylene?

Polypropylene (PP) is a thermoplastic with linear structure based on the monomer CnH2n (Figure 1). It is manufactured from propylene gas in presence of a catalyst such as titanium chloride. Polypropylene is light in weight with a low density of about 0.90-0.92 g/cm^3, compared with the density of aluminum which is 2.7 g/cm^3, and has excellent resistance to stress, cracking and corrosion.[1]

Table 1. Kinetic energy comparison of metal and polypropylene rotors.

	Polypropylene rotor	Aluminum rotor
Weight (g)	419	822
Inertia (kgm^2)	0.001395	0.003339
Kinetic energy (kJ)	1.67	4.01
To run at 10,000 rpm for 10 mins		
Accelerating energy (kWh)	0.000463	0.00111
Decelerating energy (kWh)	0.000463	0.00111
Total energy consumed (kWh)	**0.000926**	**0.00222**

Figure 1. Linear structure of polypropylene.



Lighter weight

In addition to being easy to handle, experiments have shown[2] that accelerating and decelerating a polypropylene rotor in a microcentrifuge requires up to 40% less energy than a metal rotor of the same performance and geometry. In a 10-minute run at 10,000 rpm, 10% of energy consumption can be saved by using a polypropylene rotor.

Lightweight polypropylene rotors also have a lower inertia compared to metal rotors. In the case of rotor failure, there is less risk of damage to the centrifuge (Table 1).

Chemical resistance

Centrifuge rotors made of aluminum alloy are particularly susceptible to corrosion, typically caused by acids, alkalis and high concentrations of salt solutions. Even when anodized to decrease corrosion and wear, this anodizing film can become damaged, exposing the aluminum surface to corrosion risks which eventually will cause rotor failures.

Compared with aluminum and anodic coating, polypropylene has a much better chemical resistance to these commonly used acids, alkalis and reagents, like the bleaching agent for cleaning purpose, and as a result, is easier to manage in routine rotor care.

[1] http://www.lenntech.com/polypropylene.htm
[2] "Practical Techniques for Centrifugal Separations", Owen Mitch Griffith, Ph.D.

Conclusion: Lightweight and corrosion-resistant polypropylene rotors, available for Thermo Scientific microcentrifuges, are designed to enhance safety and productivity.

Find out more at thermofisher.com/microcentrifuge

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