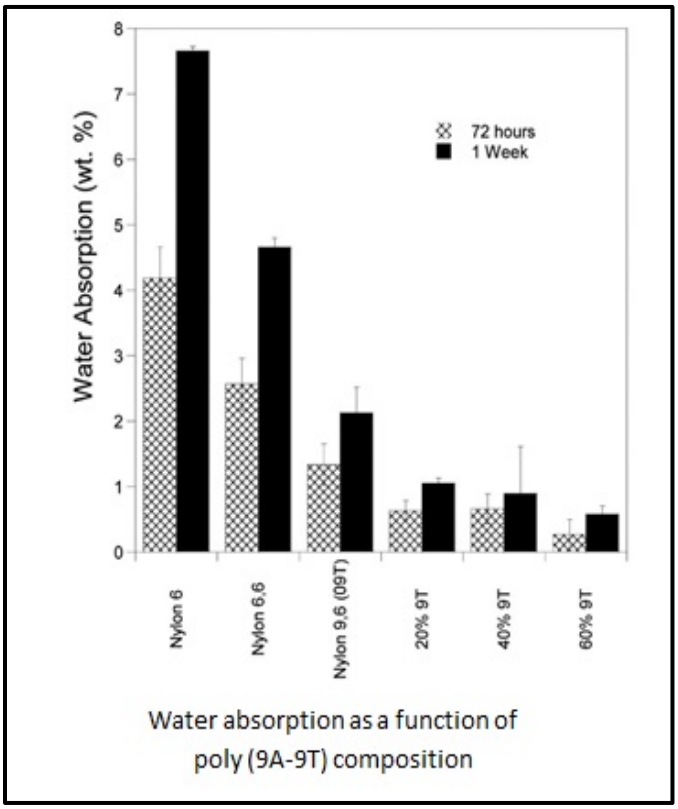
HIGH PERFORMANCE, BIO-BASED POLYAMIDES FOR INJECTION MOLDABLE PRODUCTS (RFT-452)

Invention Summary:

Scientists at NDSU have discovered a method for making a family of thermoplastics for injection molding that are based, in part, on renewable resources. Unlike other bio-based polyamides, these possess the high melting temperatures, fast crystallization rates, low moisture uptake, and good mechanical properties associated with engineering thermoplastics. These polymers can be used to replace the petroleum-based nylon 66 and nylon 6, and other semi-crystalline engineering thermoplastics, for high end injection molding applications such as the electronic and automotive parts where heat tolerance is needed.

Benefits:

- The scaffold's N-N bond can also be made an atropisomer due to restricted bond rotation - These atropisomers can be separated, are thermally stable, and can be employed in light-induced reactions with >95% selectivity
- Either a single nitrogen or a N-N moiety can be retained upon removal of the scaffold, providing opportunities to generate a wide variety of unique compounds whose performance differs from compounds that are currently available
- Less expensive production, because fewer steps are required, and metal is not – this translates to less purification, fewer reagents, and less energy consumed
- Lower energy visible light (as compared with commonly used UV) initiates the reactions in an easy, efficient, and cost-effective process
- Desired end products can be obtained and optimized by using specific wavelengths



Water absorption as a function of poly (9A-9T) composition

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Applications:

- Metal replacement application in the automotive and electronics industries
- Bio-based replacements for petroleum-based engineering thermoplastics

Properties	Nylon 6,6	FDCA Copolymer (m/n = 40/60 mole/mole)
Tg (°C) (Glass Transition Temp)	59	96
Tm (°C) (melting)	261	282
Tc (°C)	228	269
Tm-Tc (°C)	33	13
T@5% wt. loss (°C)	411	457
T@50% wt. loss (°C)	471	501
Notched Izod Impact (J/m)	40.9	53.6
Moisture Uptake (wt. %)	4.7	0.40

Phase of Development:

This technology has successfully completed laboratory testing with reproducible results.

Patents:

This technology is the subject of Issued US patent no. 9765186 and is available for licensing/partnering opportunities.

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