Artificial muscle made of fishing line is 100 times stronger than yours

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By taking simple sewing thread and fishing wire and giving it a twist, scientists have created artificial muscle that's 100 times stronger than human or animal sinew. The invention, described in the journal *Science*, could be useful for prosthetic limbs, humanoid robots, implanted medical devices and even wearable clothing.

This wouldn't be the first artificial muscle out there: there are carbon nanotube yarns and metal wires, but they're often expensive or store relatively low amounts of energy compared to their competitors, scientists said.

These new high-strength polymer fibers, made out of cheap, everyday materials that cost about $5 per kilogram, draw their strength from their geometry. In experiments led out of the University of Texas at Dallas in Richardson, scientists took these thin fibers that were just a few hundred micrometers long and twisted them until they began to coil. (You can see this same effect yourself if you take a rubber band and twist it until it starts to collapse into larger loops.)

As it coils, the twisted fiber cable becomes shorter and thicker, and then the researchers heat-treated it to make it set. The scientists found that if they made the fiber coil in the same direction as the twist, the fiber cable would contract. If the fiber was forced to coil in the opposite direction of its twist, the fiber cable would expand.

When they applied an energy source to the fibers-typically heat-the

scientists got different versions of their artificial muscle fibers to contract by 49 percent or to expand by 67 percent. They even produce 7.1 horsepower per kilogram, about the same power as a jet engine (when scaled down for size). And the fibers can last through millions of these cycles, making them very durable, reusable devices.

"Despite their small diameter, the fibers can be indefinitely long and used in large structures," Jinkai Yuan and Philippe Poulin, scientists from the University of Bordeaux in France who were not involved in the paper, wrote in a commentary.

The scientists think this could be useful for a number of applications that need muscle fibers, whether getting the faces of humanoid robots to move with more human-like expressions or getting prosthetic limbs better muscle. They could be used to automatically open and shut blinds in response to the outside climate. The researchers already have created a textile with pores that expand and contract in response to heat-which could lead the way to adaptable, breathable clothing.

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