The Effect of Wrapping Space on Pressure Required for Bending in Fiber Reinforced Soft Actuators

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The purpose of this experiment was to find out whether the distance between double-helical wrapping around fiber reinforced soft actuators affects the pressure required to achieve bending. Fiber reinforced soft actuators are pneumatic robot arms made from soft materials with a strain limiting layer and double-helical wrapping that assist in allowing it to move. If the wrappings on a fiber reinforced soft actuators are close together, then less pressure will be required to achieve bending. To test this, an actuator was created with silicone rubber and fiberglass. A hole was poked into one side, and the needle of a tire pump was inserted into the hole. The actuator was connected to the tire pump, and pumped until bending was achieved. After bending had been achieved, the PSI indicated on the tire pump gauge was noted. Three trials were run: one where the actuator had no wrapping, one where the actuator had wrapping 1 inch apart, and one where the actuator had wrapping 2 inches apart. The actuator with no wrapping required 11 PSI to bend, the actuator with wrapping 1 inch apart required 5 PSI, and the actuator with wrapping 2 inches apart required 7 PSI. The hypothesis was proven correct, and the closer together double-helical wrappings are, the less pressure required to achieve bending. This data can be applied by robotics engineers who work with soft robotics and pneumatic systems.

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