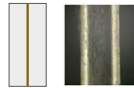


Hygroscopic Actuation

Bounded H_2O molecules cause high radial and low axial expansion by swelling



ΔM (%)



Untwisted Monofilament

Twist under tensile load.
Thermally anneal.



ΔT

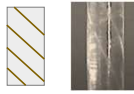


Heated drawn polymer monofilament expands radially and contract axially

Bounded H_2O molecules cause untwist due to the new twisted fiber orientation



ΔM (%)



Straight-twisted polymer actuator (STPA)

Twist under tensile load until coiled to helix. Thermally anneal.



ΔT

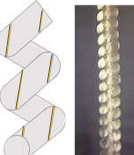


High stiffness internal fibers helically orientated cause shear deformation

Torsional response of STPA translates to contraction of TCPA due to the swelling in the material



ΔM (%)



Twisted-coiled Polymer Actuator (TCPA)



ΔT



The thermal torsional response of STPA translates to contraction of TCPA.