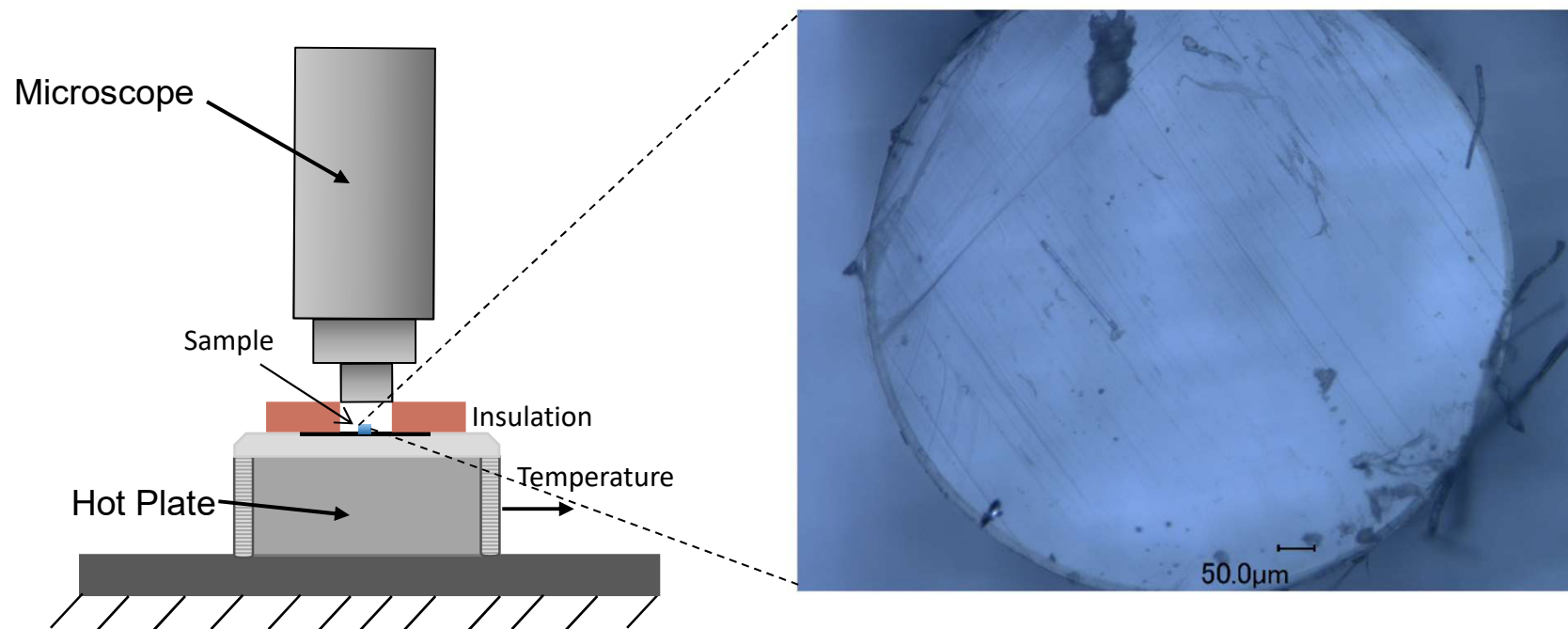
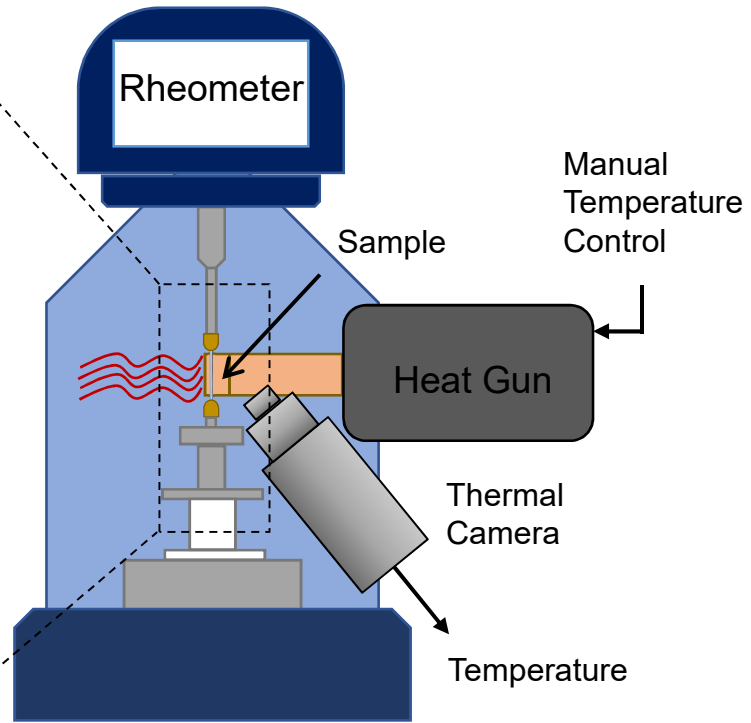
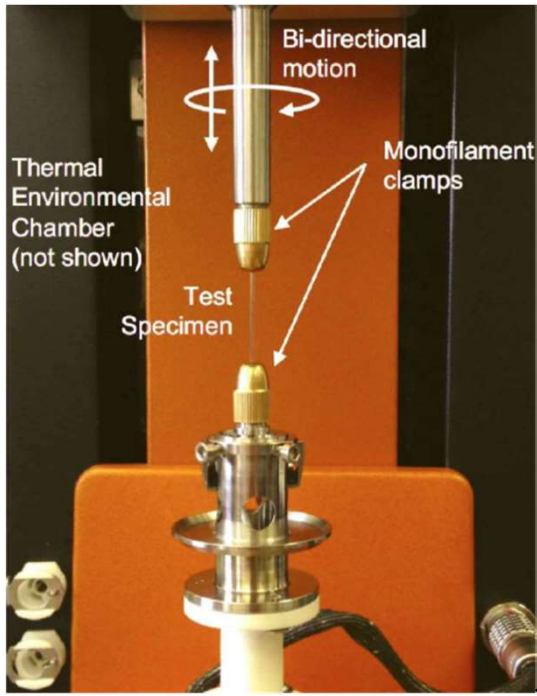
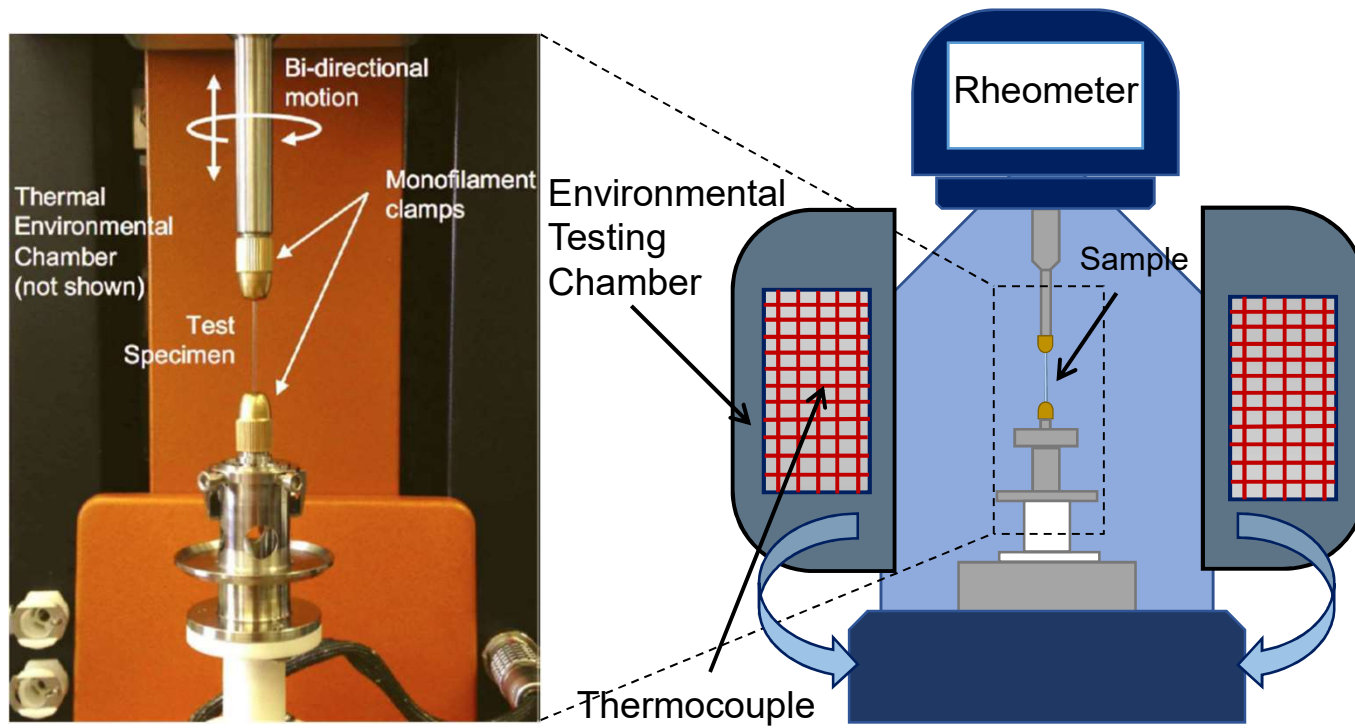


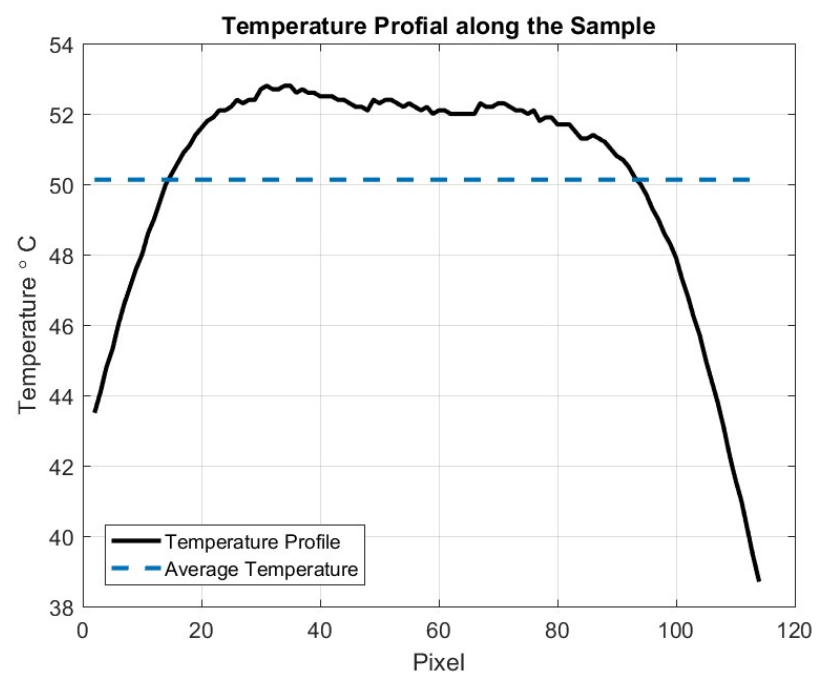
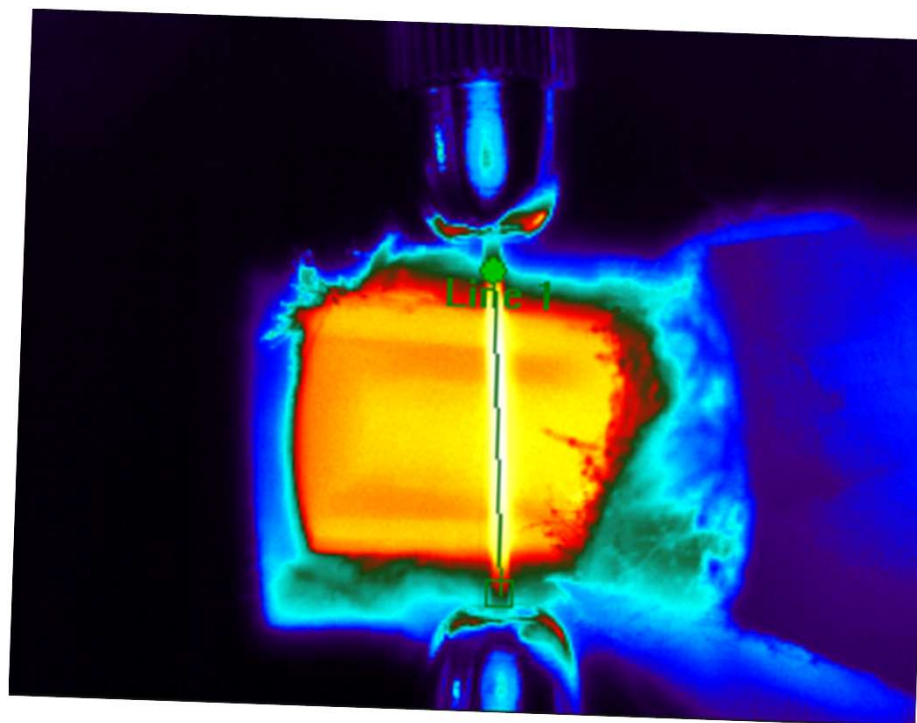


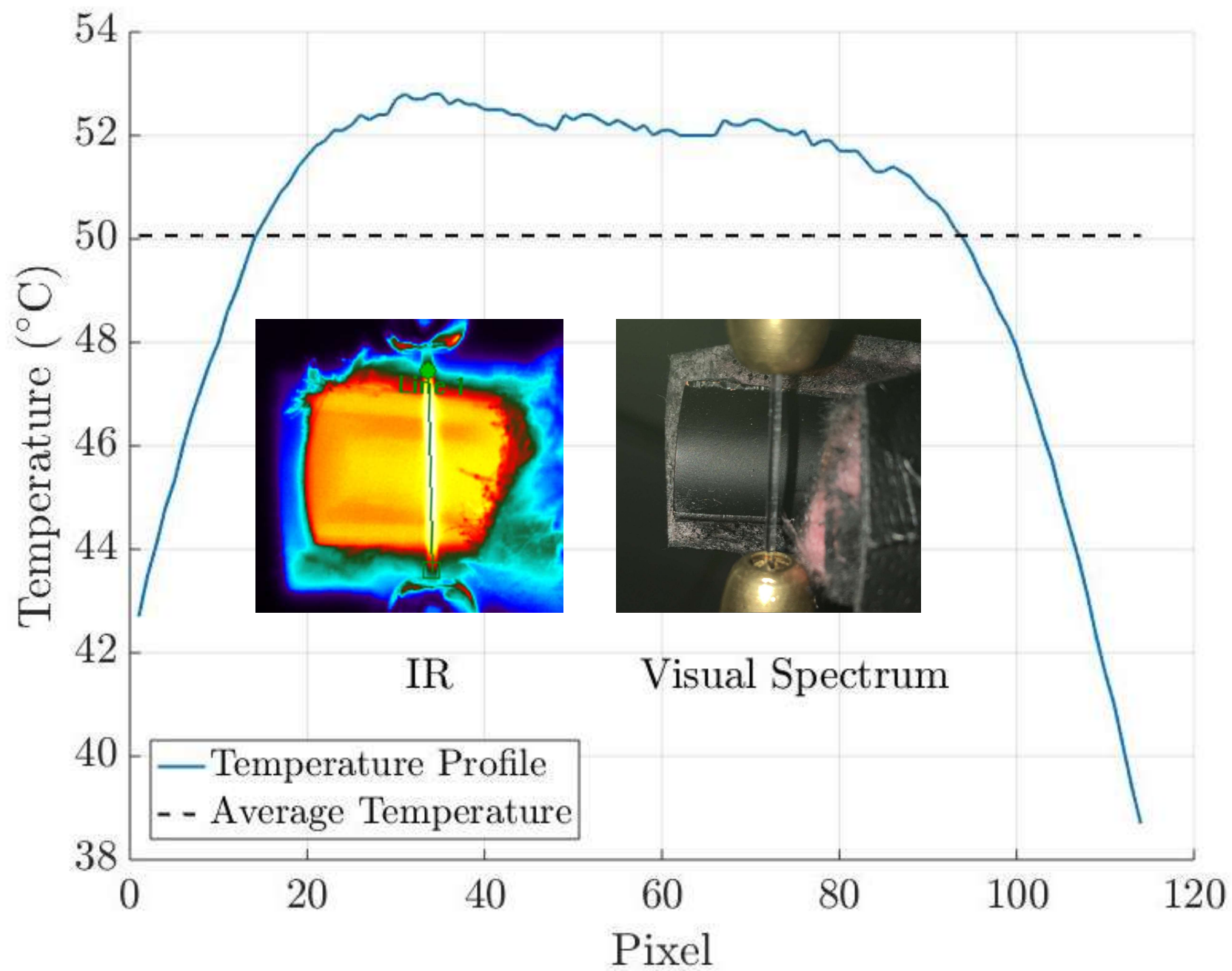
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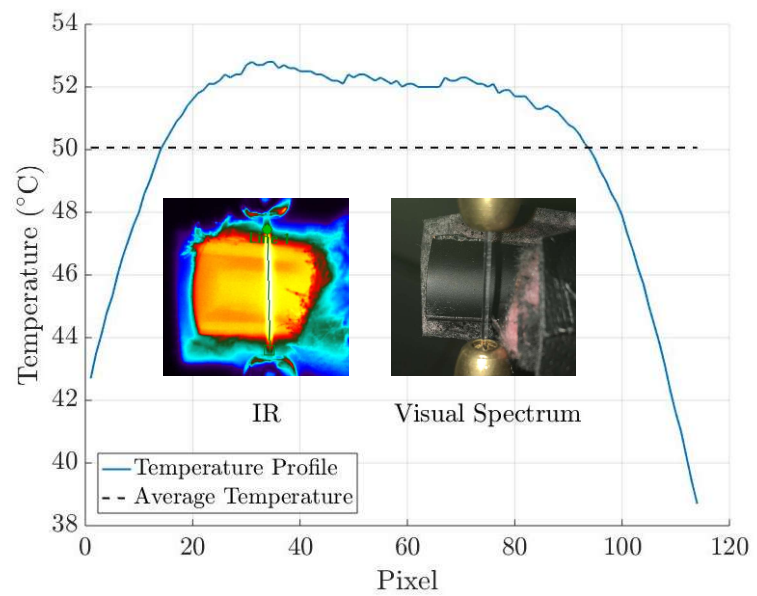


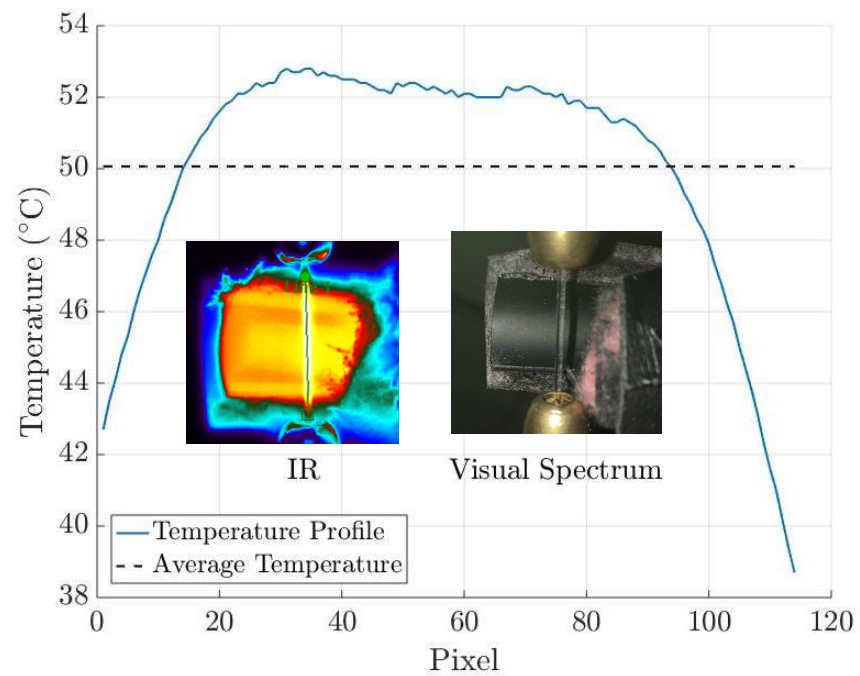
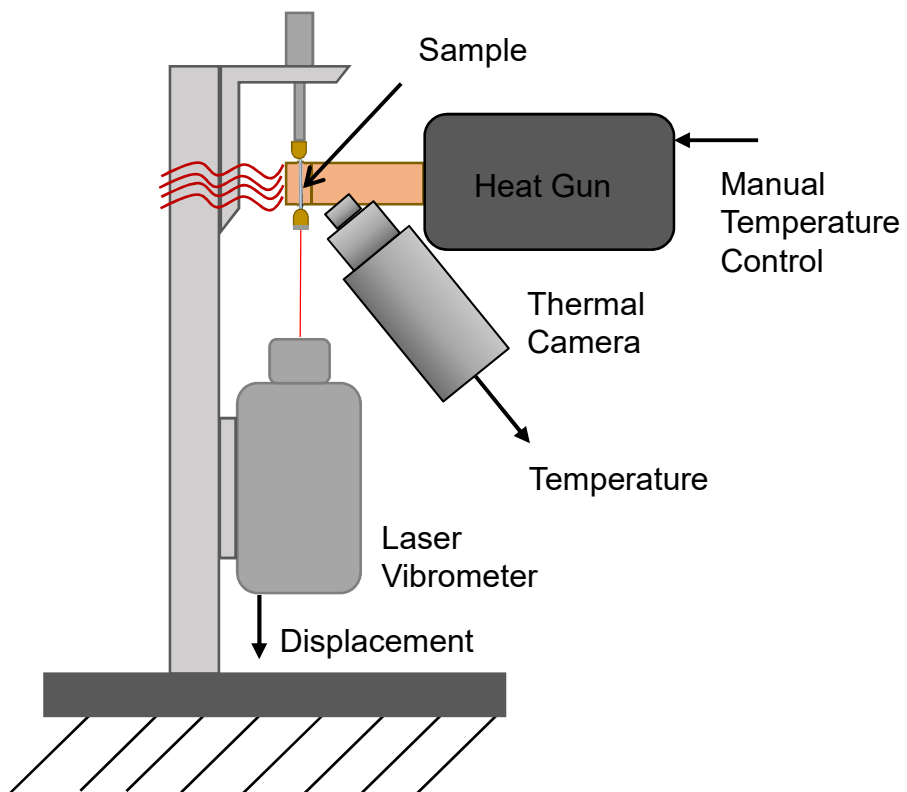


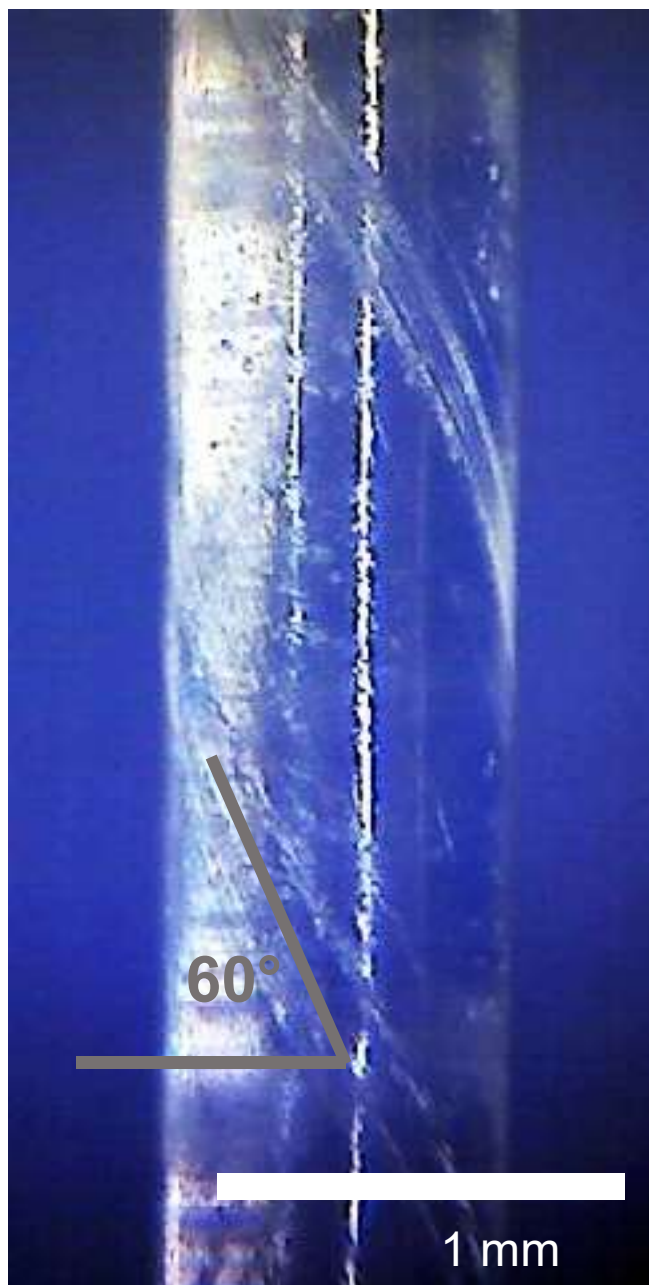


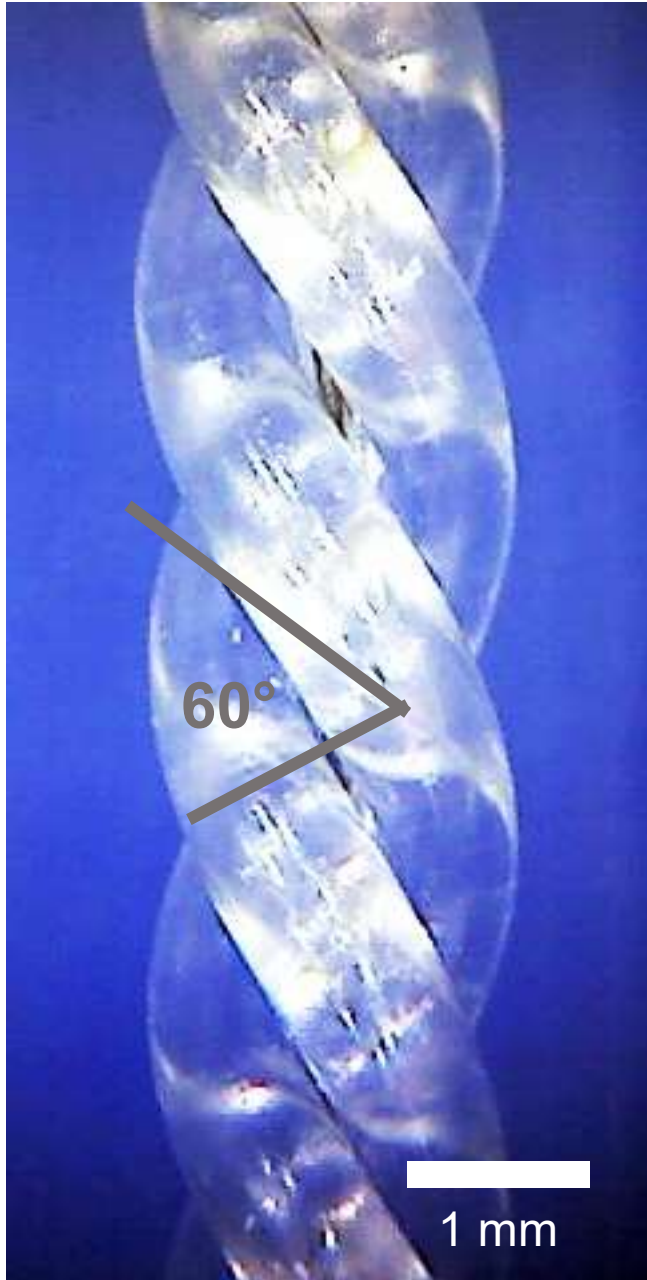


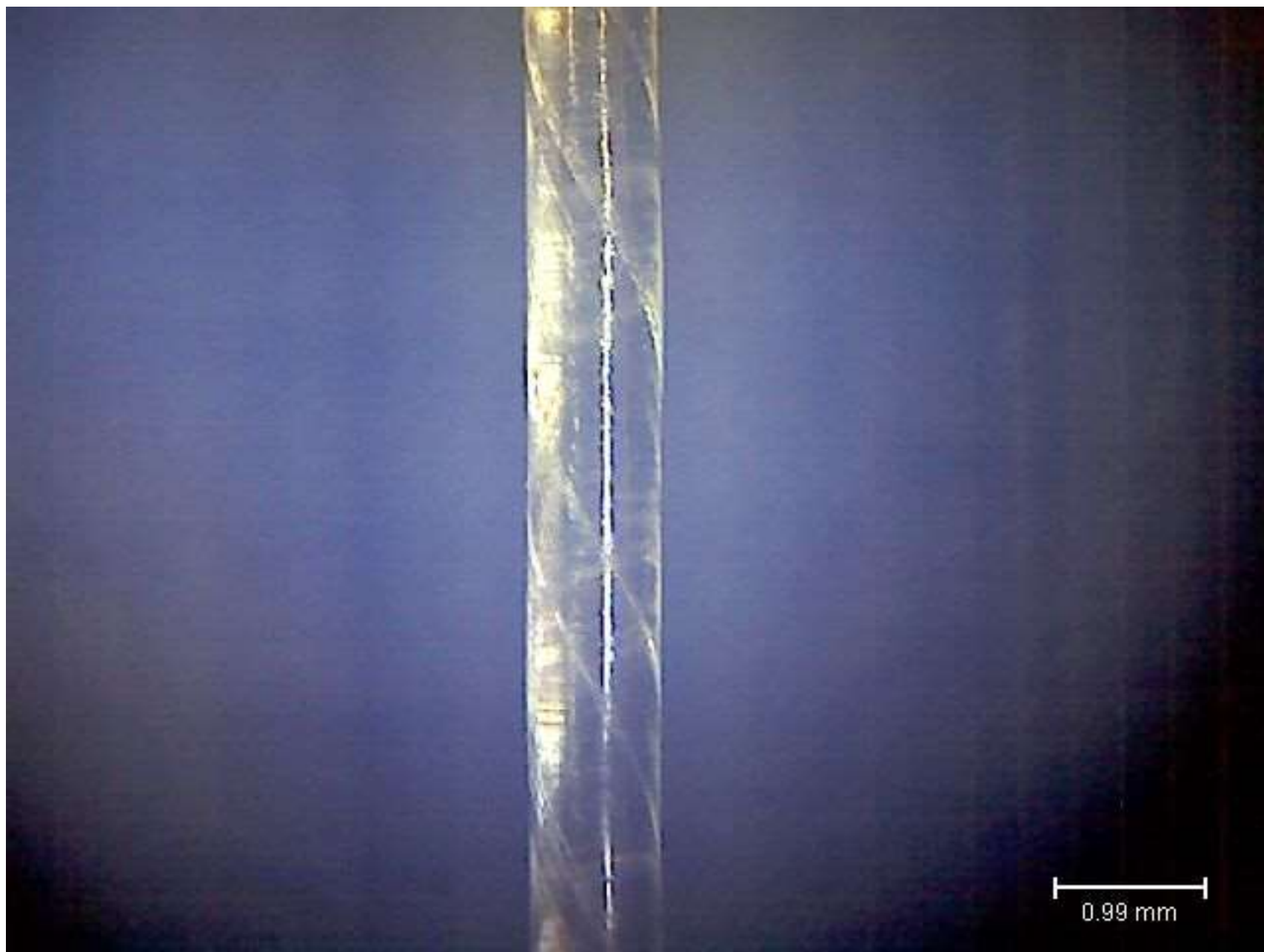


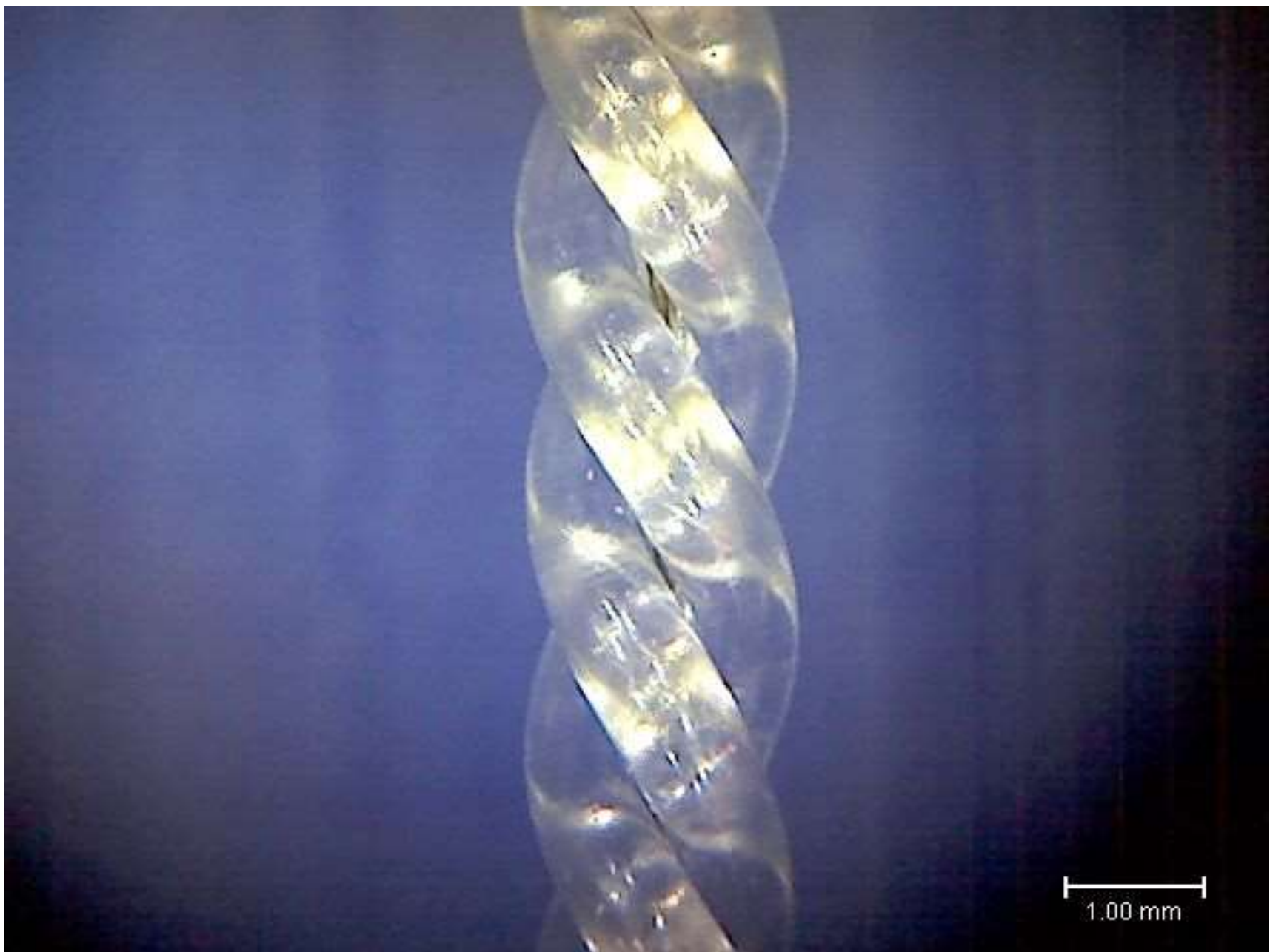
















Precursor Fiber

Twist under tensile load.
Thermally anneal.

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

Straight-twisted polymer actuator (STPA)

Twisted-coiled Polymer Actuator (TCPA)

Reference
line

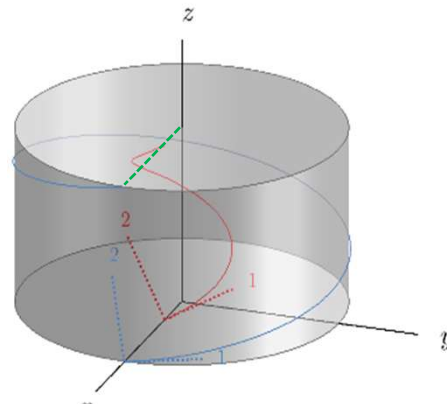
Torsional
deformation

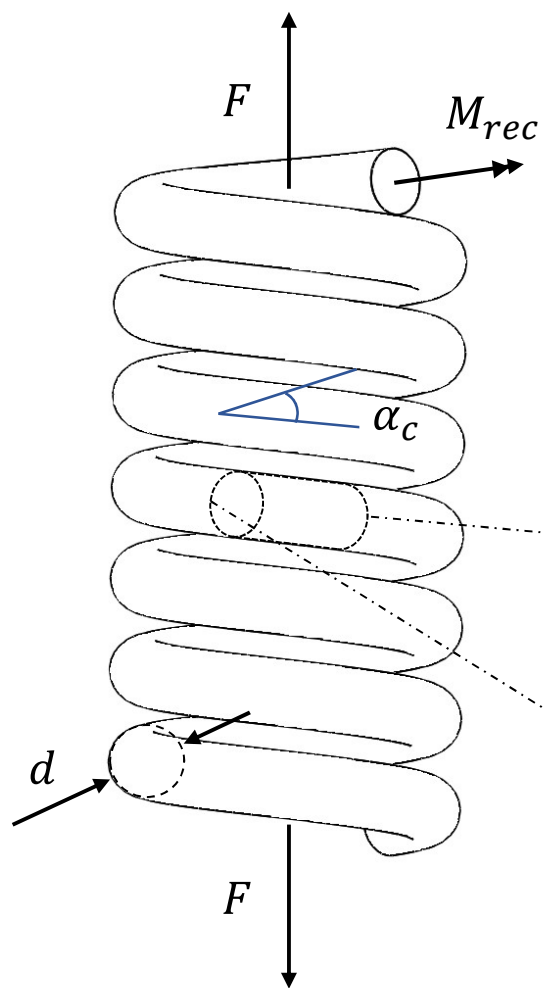
ΔT
Actuation

ΔT
Actuation

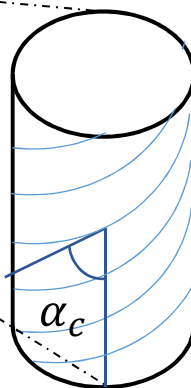
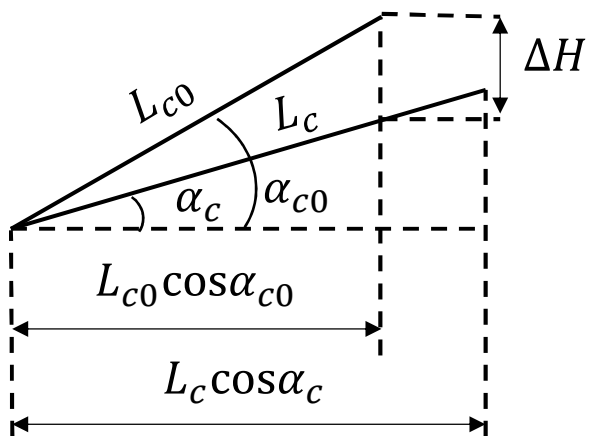
Contraction

Iso-view showing radially
varying polymer chain
pitch for TPAs



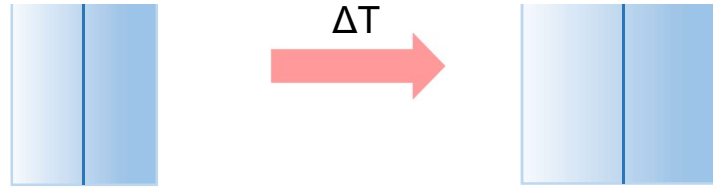


TCPA



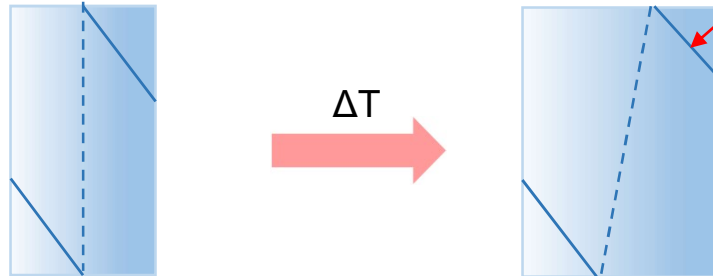
STPA

**Precursor Fiber
(monofilament)**



Twist under tensile load.
Thermally anneal.

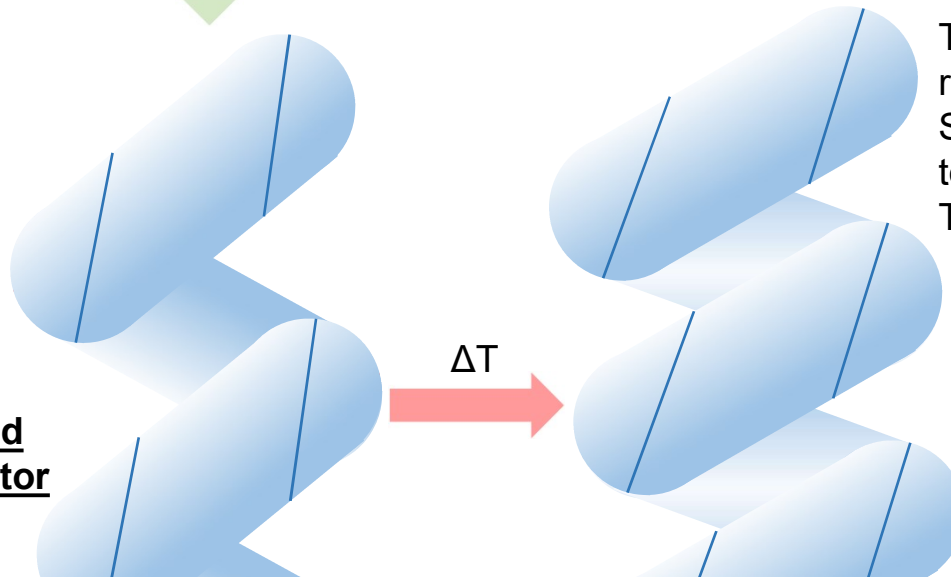
**Straight-twisted
polymer actuator
(STPA)**



High stiffness
polymer chain
now wraps
around larger
circumference
causing shear
stress and
deformation due
to low shear
stiffness.

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

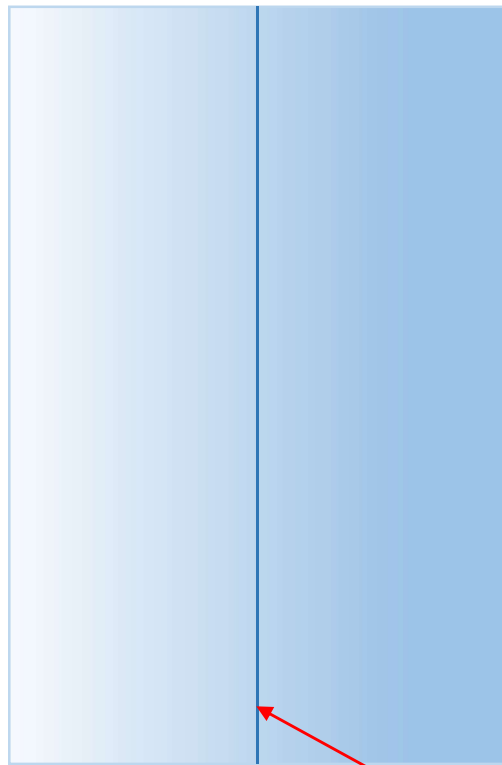
**Twisted-coiled
Polymer Actuator
(TCPA)**



Torsional
response of
STPA translates
to contraction of
TCPA.

Fabrication of STPAs

**Precursor
Monofilament**

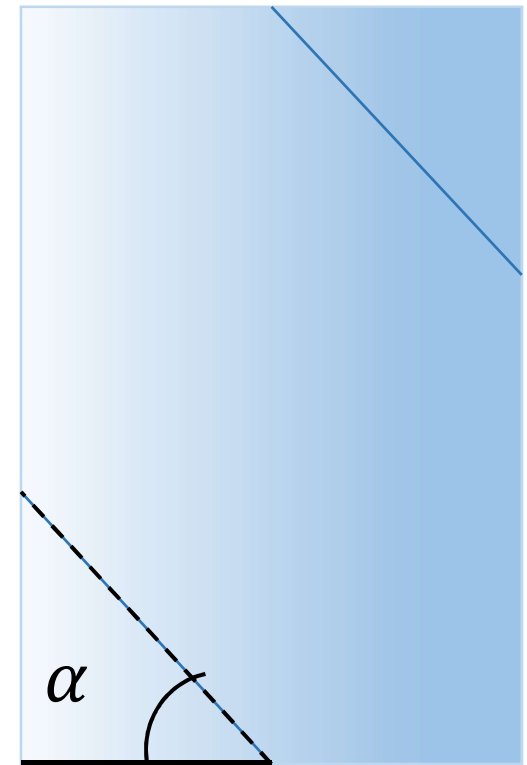


Reference line

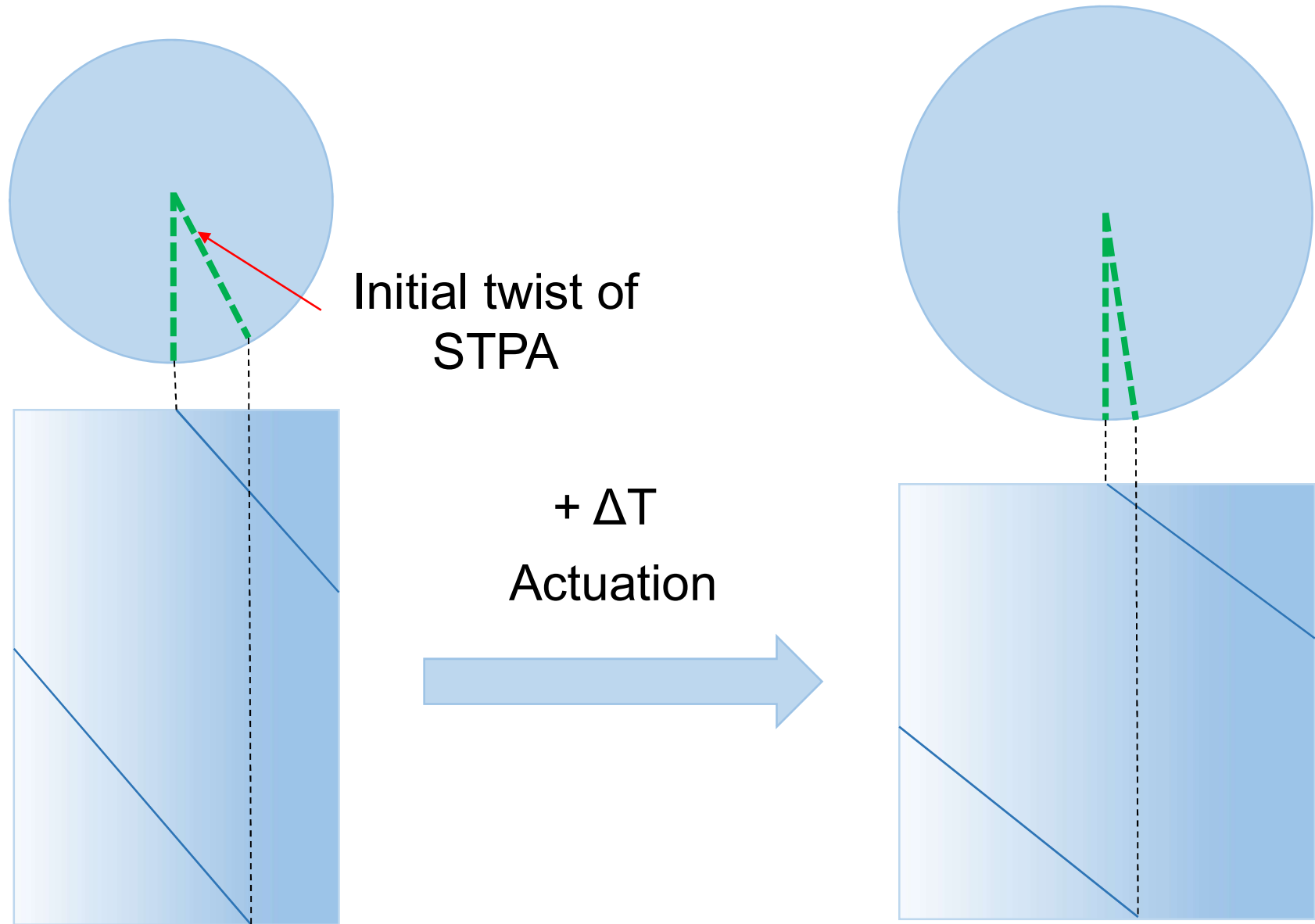
Twist under
tensile load, then
thermally anneal.



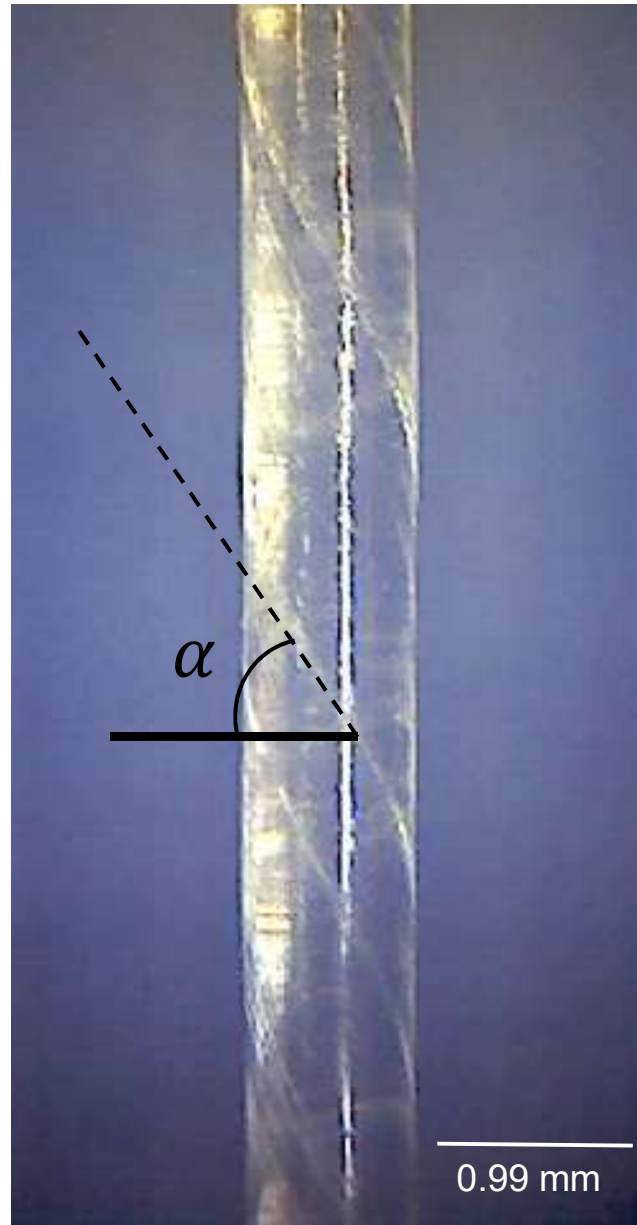
STPA



STPAs Actuation

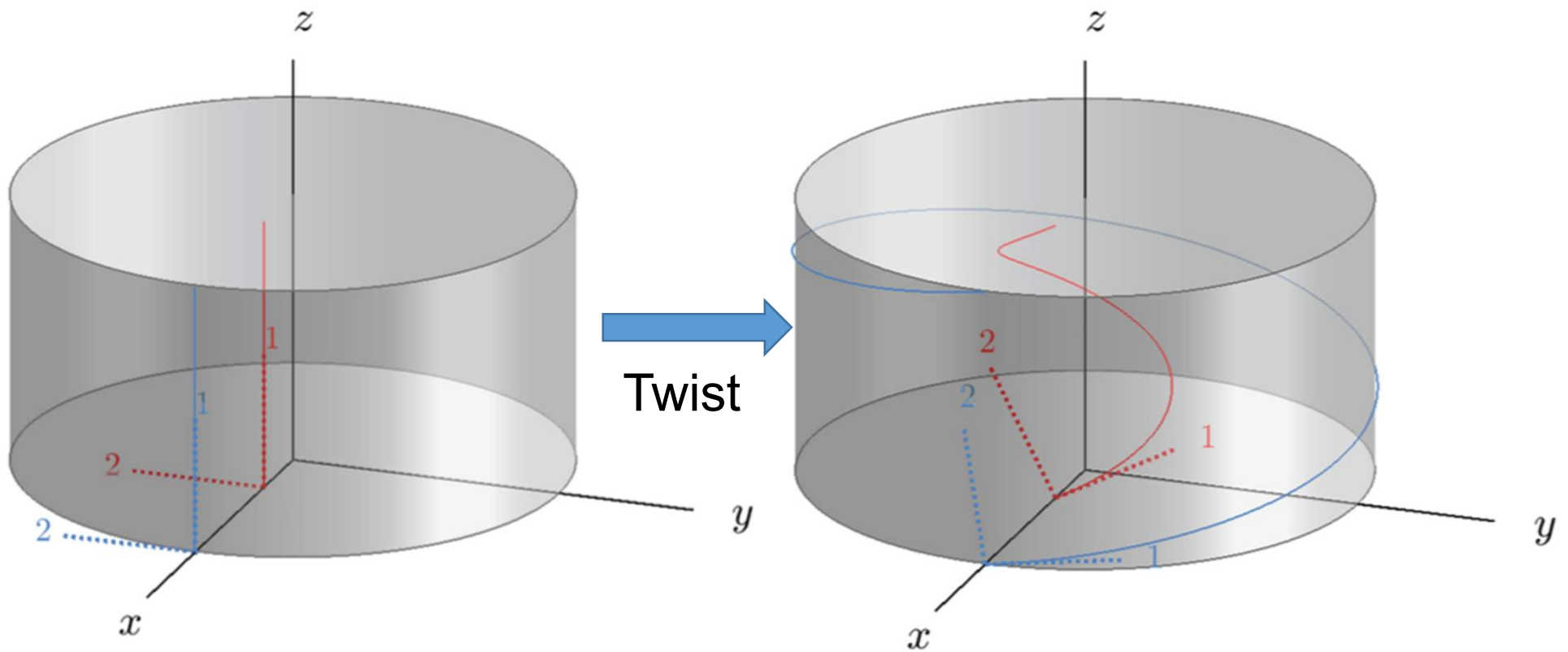


STPA Photo

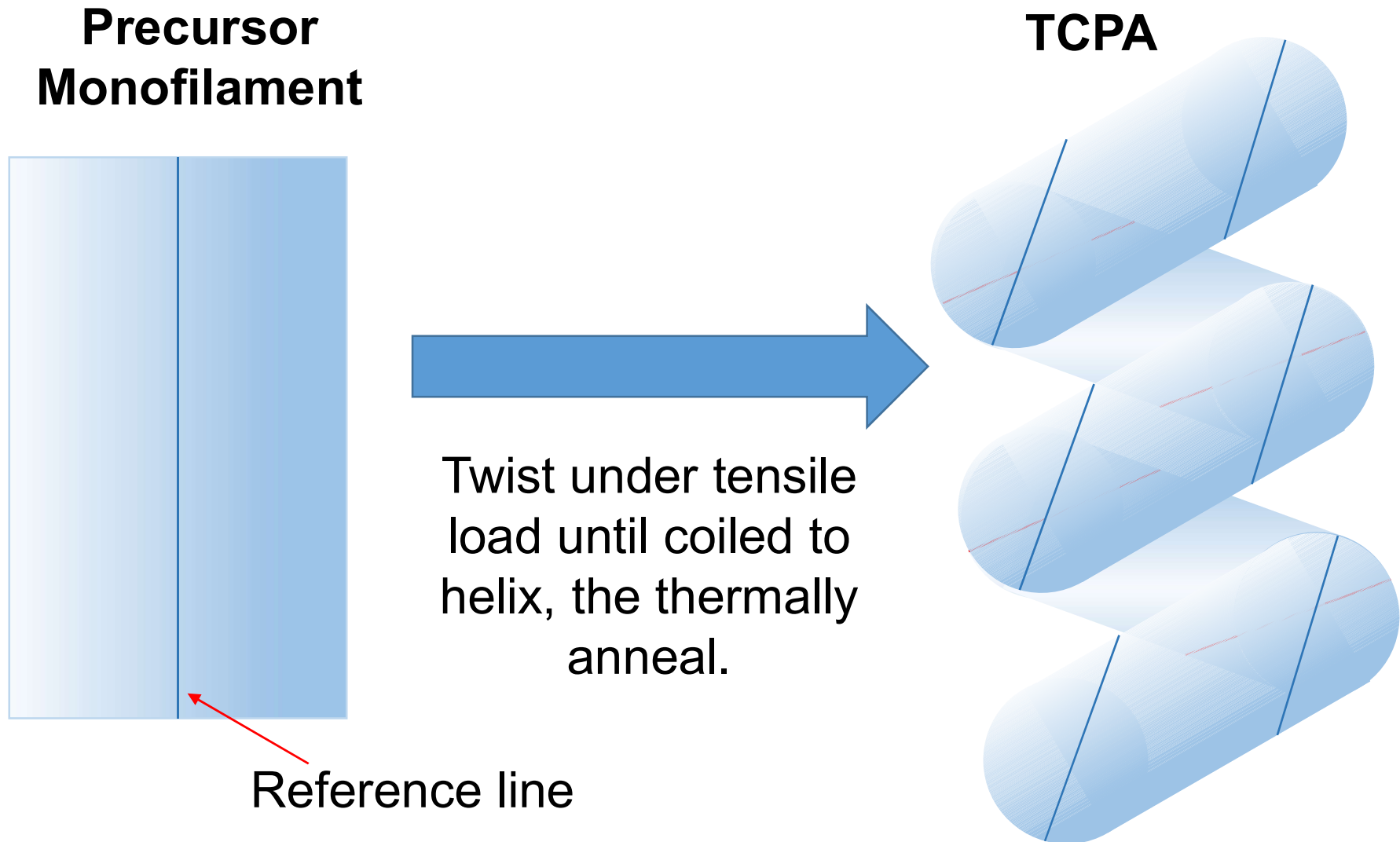


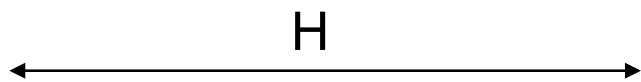
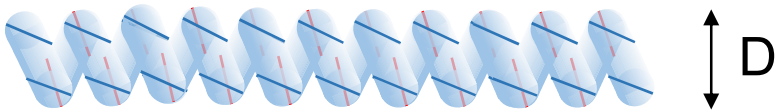


Pitch Angle Variation

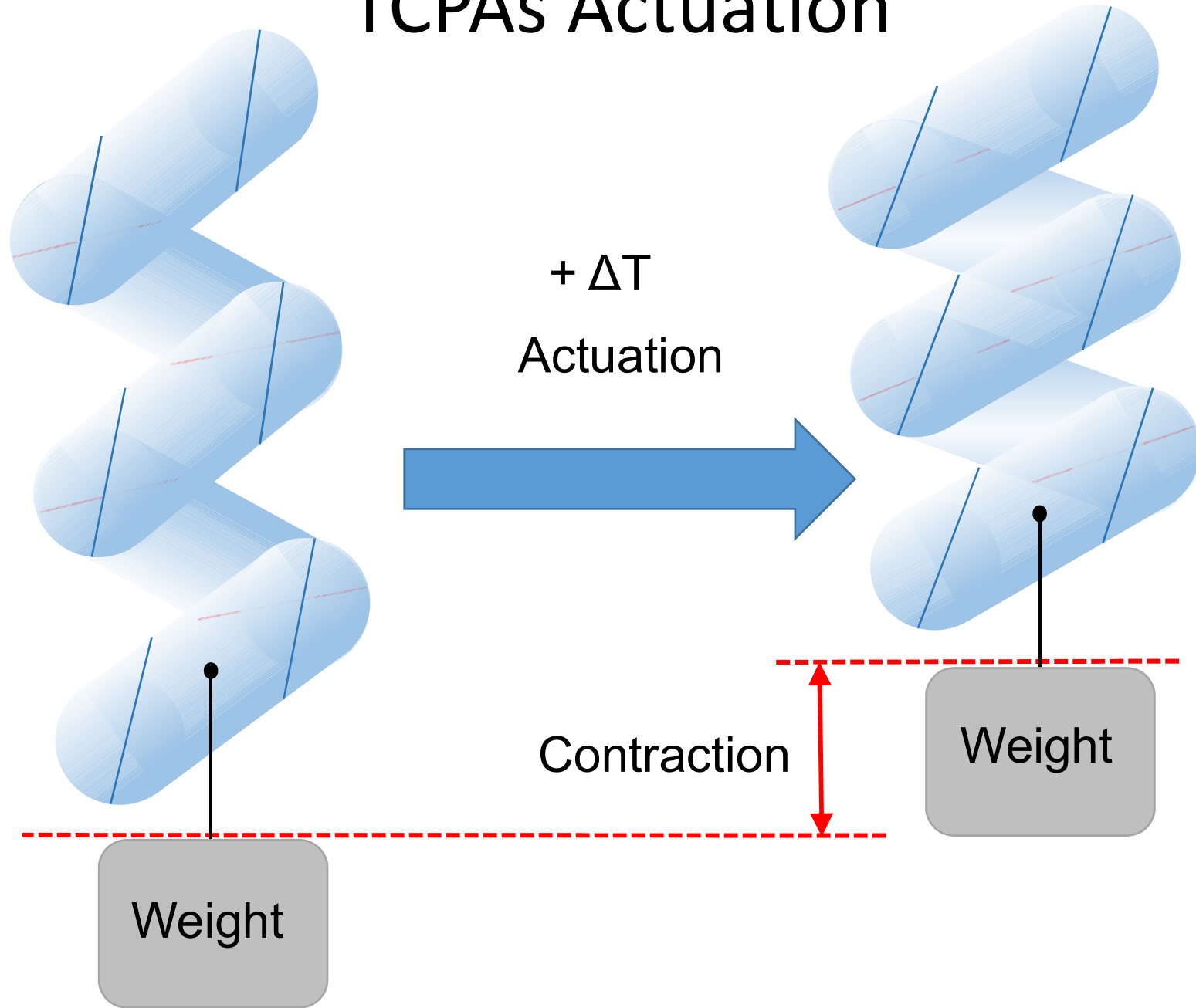


Fabrication of TCPAs





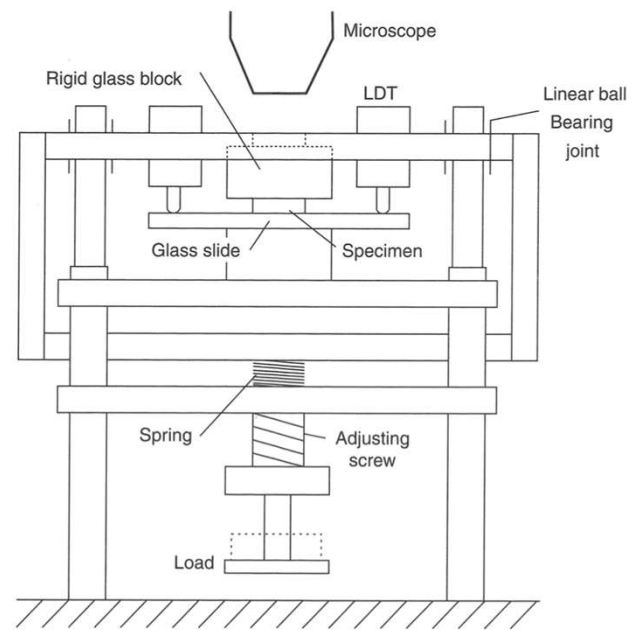
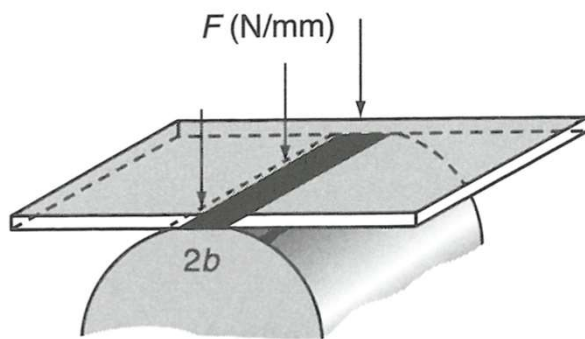
TCPAs Actuation



TCPA Photo







Twisted-coiled
Polymer Actuator
(TCPA)

