

# Soft Actuator

## for Ultra-low Temperature

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## Abstract

Previous soft actuator couldn't be applied to low temperature environment because these component materials, rubber or plastic materials, have low temperature brittleness. In this study, we have succeeded in developing a soft film actuator for a liquid nitrogen temperature environment, 78K. The actuator is fabricated by welding only two polyimide films.

## Introduction

Using liquid nitrogen temperature (77K, -196°C) has many advantages for medical treatment, freezing cells, blood, and so on.

### Problem

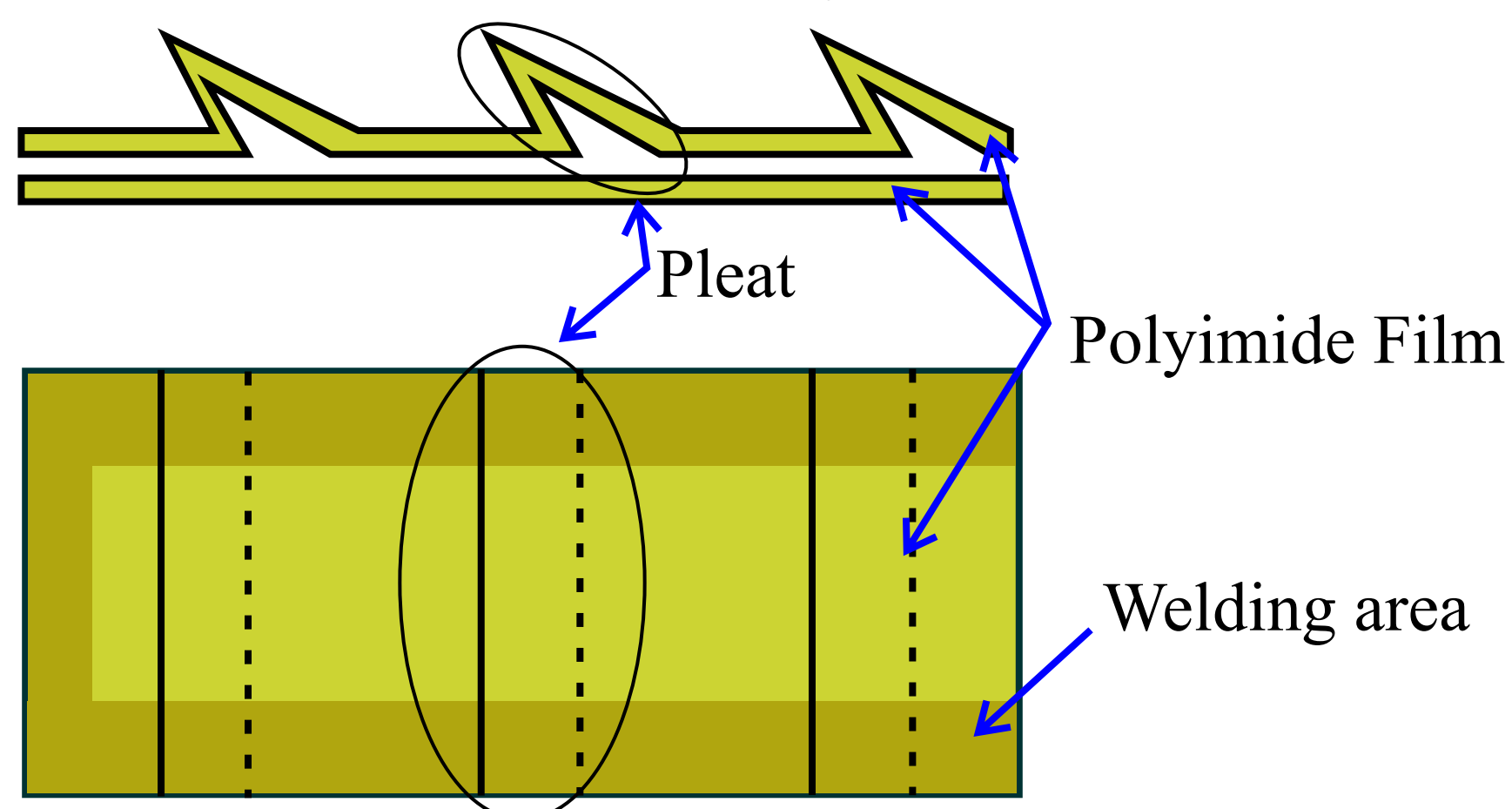
- Biological samples have low temperature brittleness.
- Conventional actuators are difficult to operate the frozen samples.

We have succeeded in developing Soft Actuator for Ultra-low Temperature.

... SAUT

## SAUT

- Made by using only two polyimide films
- Driving at liquid nitrogen temperature (-195°C, 78K)
- Lightweight & Softness
- Low cost & Disposability



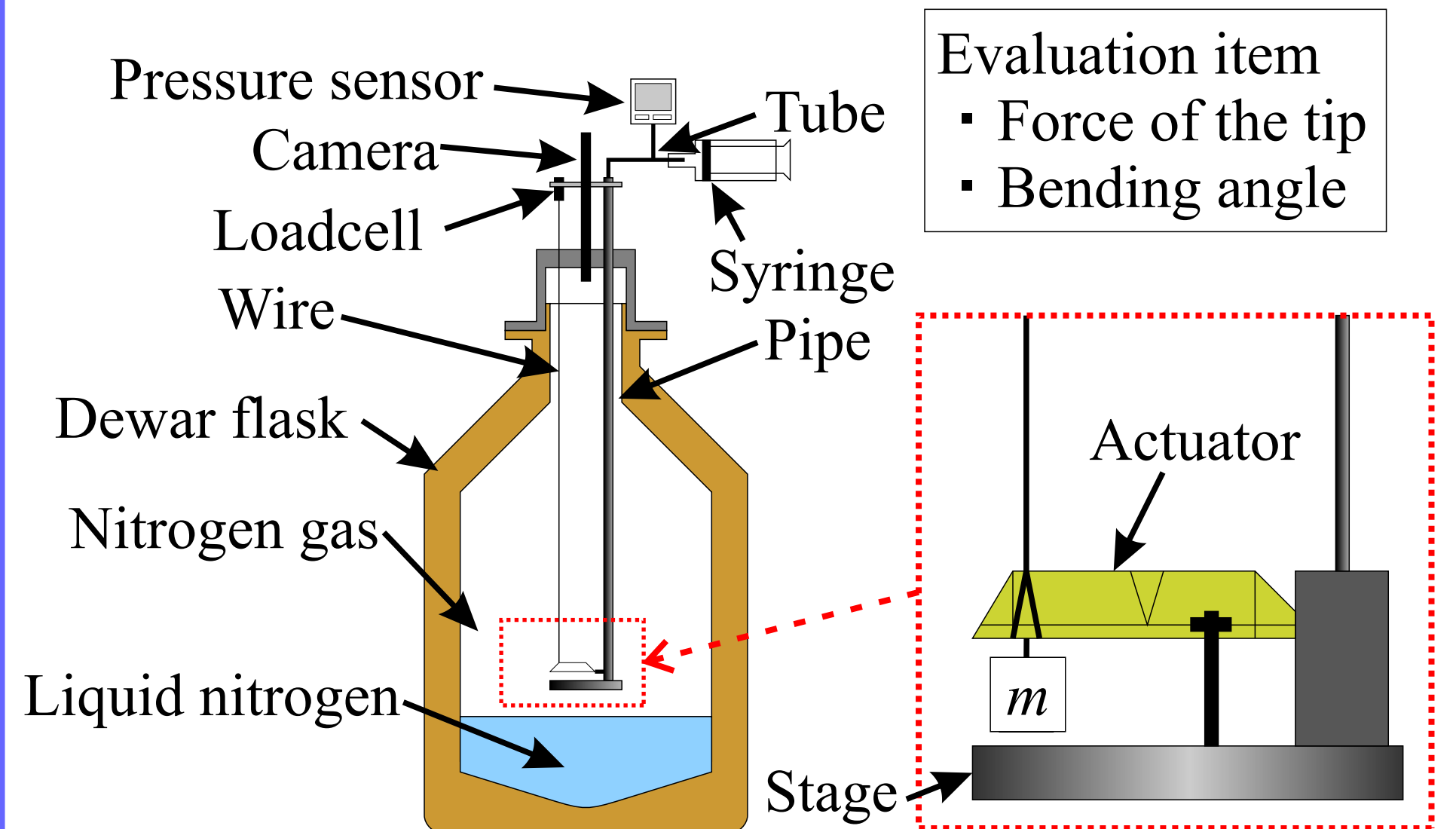
- Thickness of films : 25 μm
- Size of the actuator (without heal-welded area) : 10 × 40mm
- Mass of the actuator (without piping) : 60mg



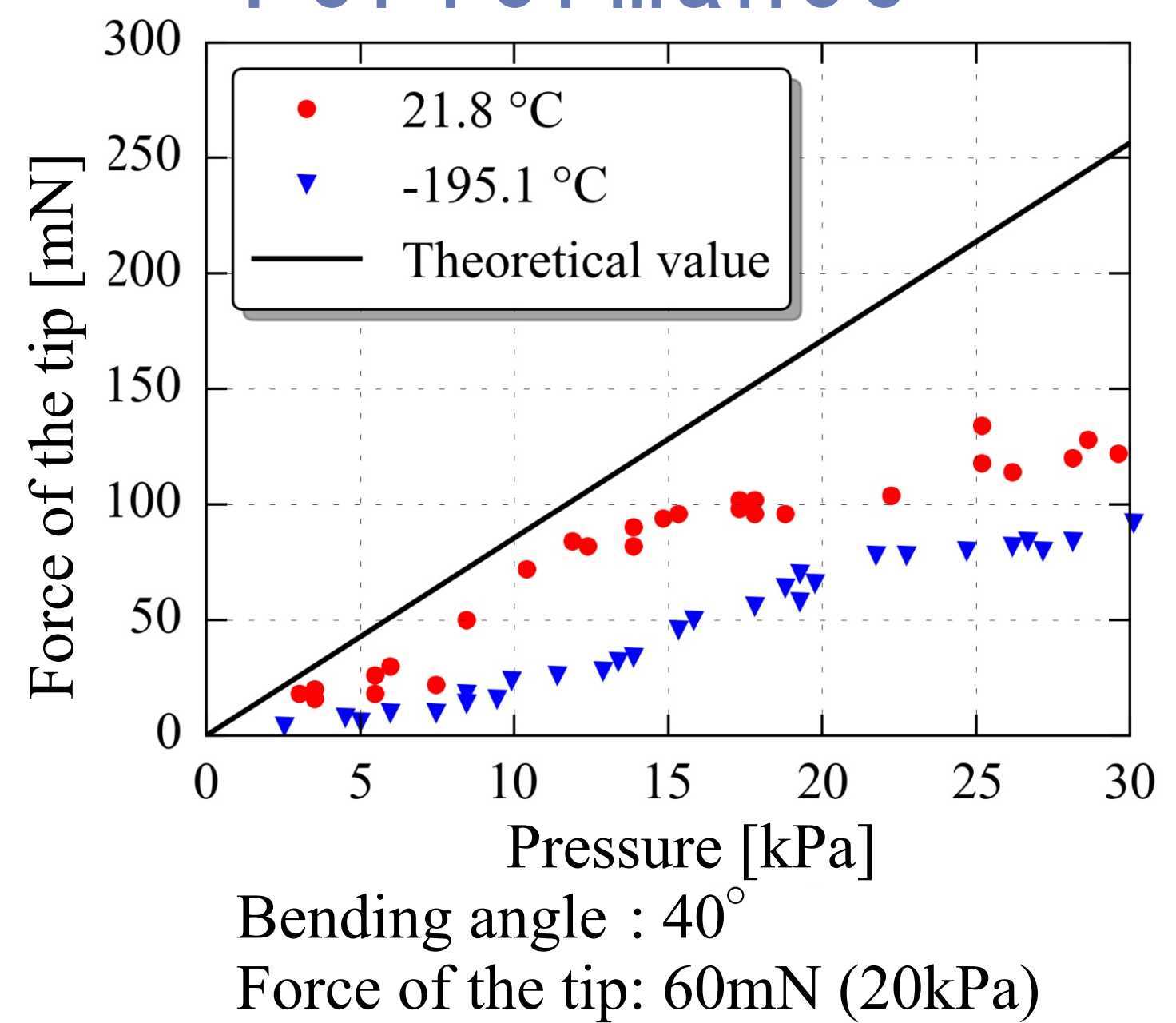
Negative Pressure

Positive Pressure

## Cryostat



## Performance

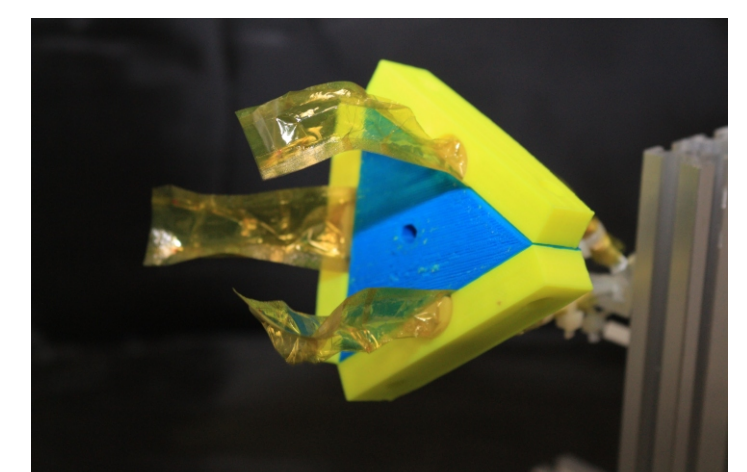


## Future plan

- Apply to another extreme environment e.g. Ultra-low-temperature (4K), Vacuum, High radiation
- Manipulator for low-temperature

Film + Robotics

➔ Filmotics



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