

Prototype of film endoscope for narrow environment using textured film actuator and small camera

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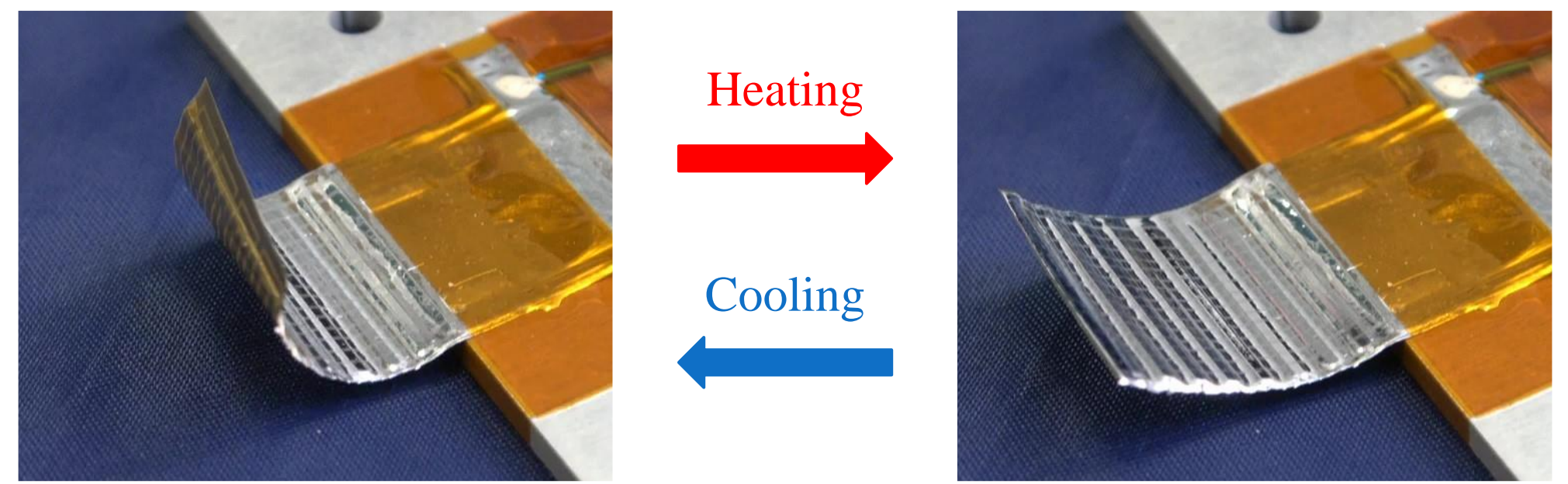
INTRODUCTION & AIM

◆ Narrow environment

- Impossibility of human entry and associated risks
- Requirement for efficiency through mass loading and deployment

◆ Textured actuator

- Welding of two types of polyimide (PI) films and transferring a pattern (texture) on the surface
- Unfolding through heating, contraction by natural cooling



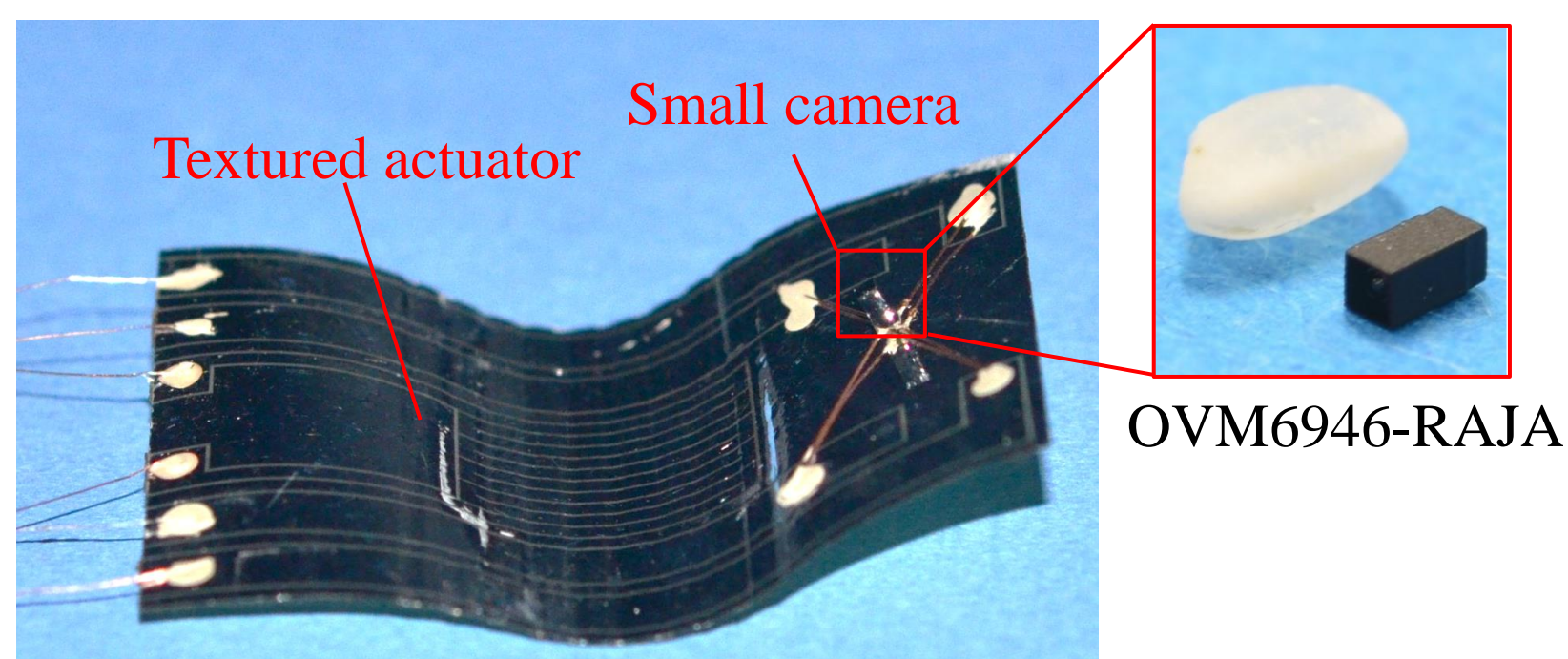
Textured actuator[1]

This research Film endoscope with a camera mounted on the tip of a textured actuator

METHOD

◆ Feature of film endoscope

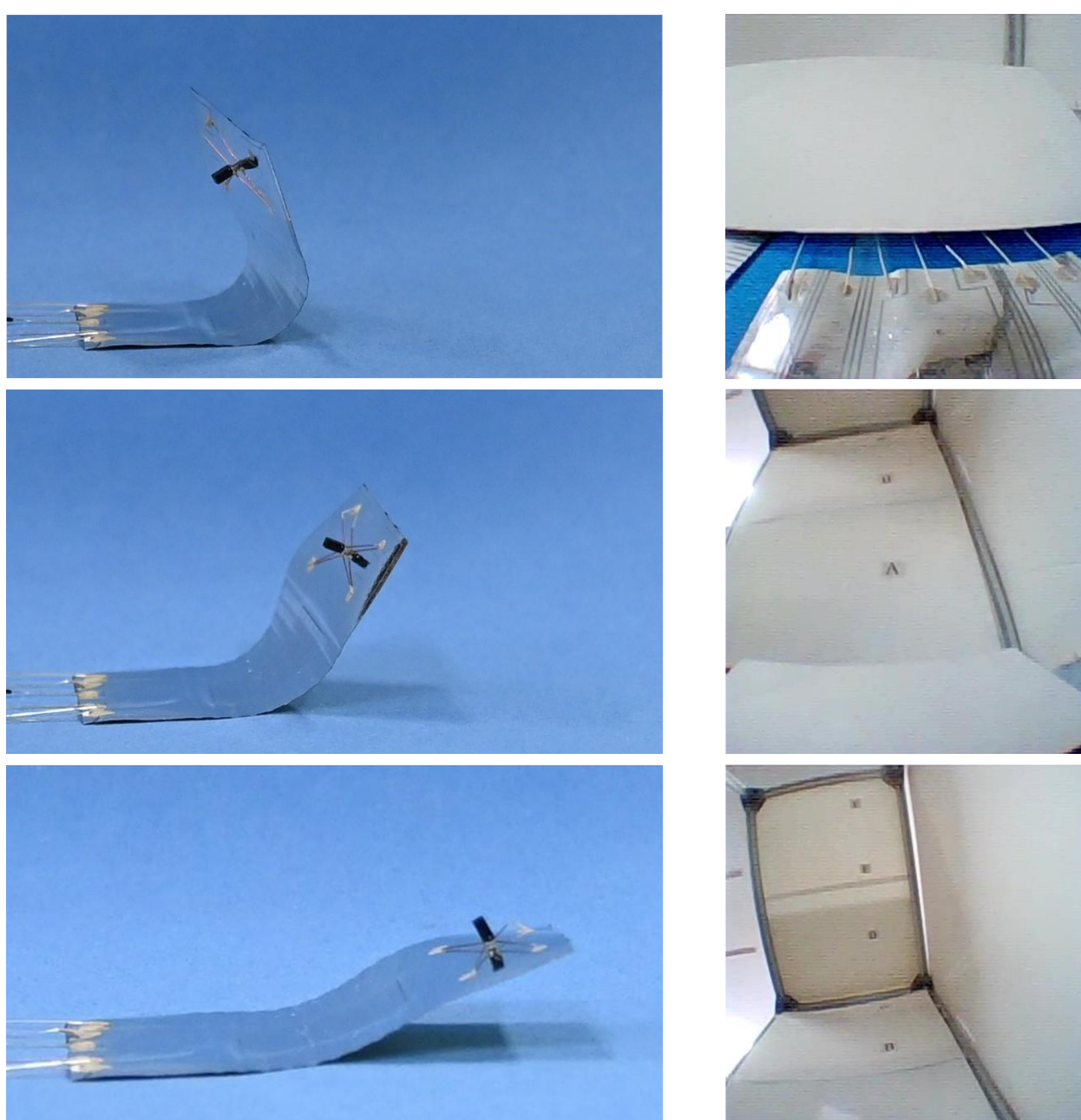
Dimension [mm]	28 × 45
Mass [mg]	85
Maximum height [mm]	4.1 (Depend on camera height)
Minimum height [μm]	50



◆ Outline of film endoscope

Utilization of the actuator's unfolding motion

- ➔ Field of camera view changes in 1 DOF direction



Film endoscope

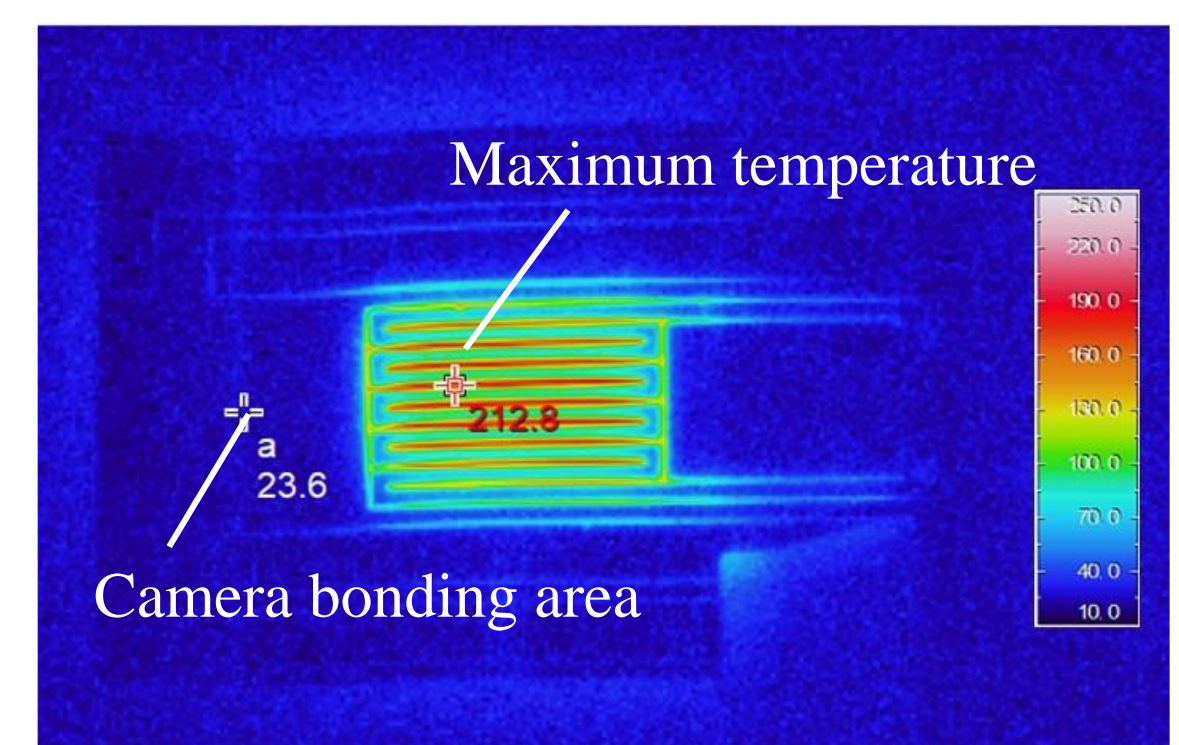
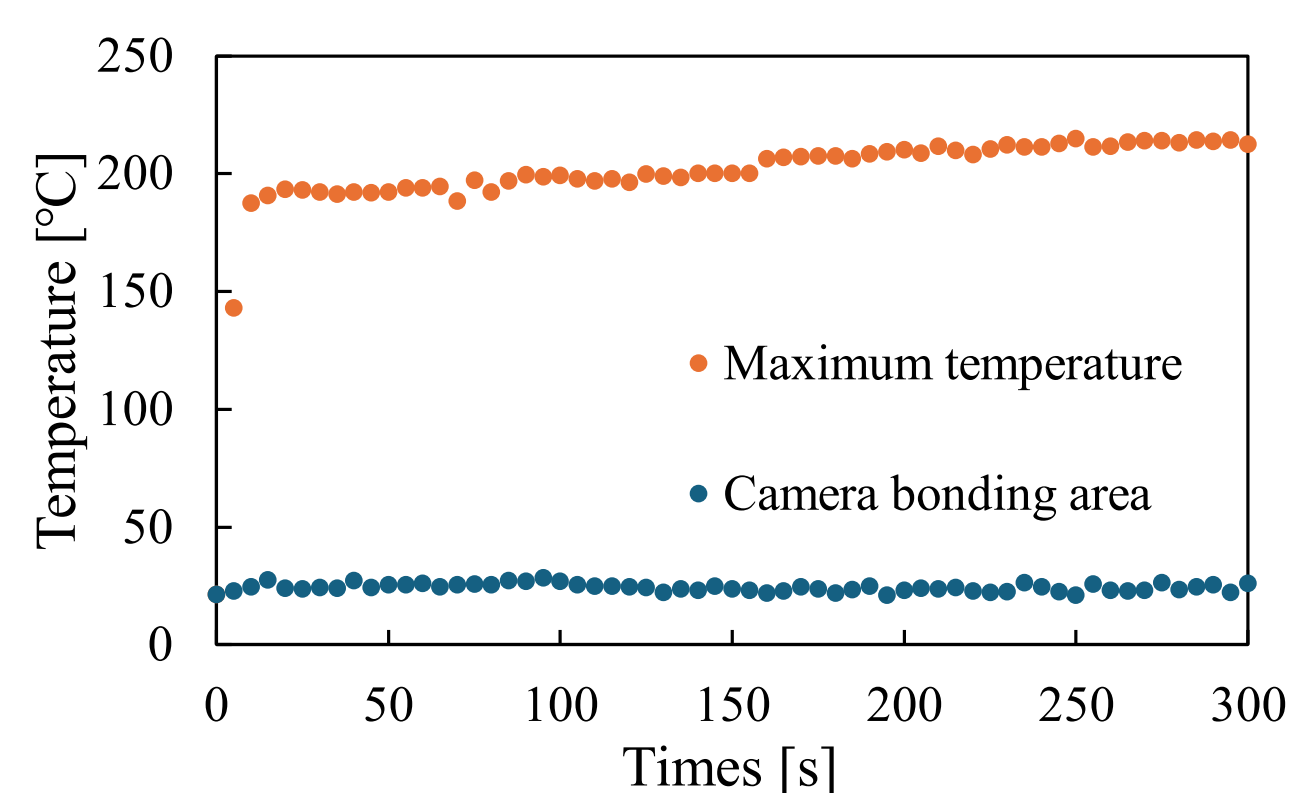
Camera image

- Capable of checking confined environments
- Relatively simple, lightweight and thin profile

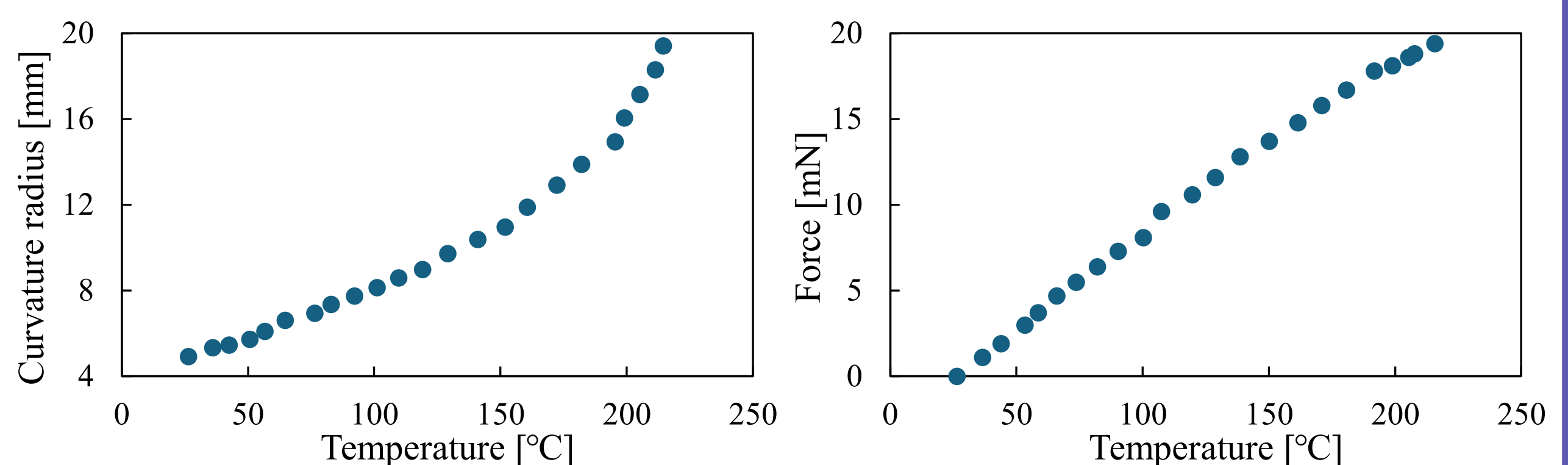
RESULTS & DISCUSSION

◆ Measurement of textured actuator surface temperature

- The camera is not subjected to high temperature.



◆ Evaluation of curvature radius and force



- The radius of curvature of the endoscope was 19 mm by applying an electrical power of 1.5 W and a temperature of 216 °C.
- The generated force was 20 mN under the same conditions.

CONCLUSION / FUTURE WORK

- ◆ Film endoscope was fabricated and evaluated.
- ◆ The endoscope can move through the field of view with 1 DOF by applying electrical power to the textured actuator.
- ◆ Multiple DOF may be achieved by dividing the texturing.

REFERENCES

1. Kazutaka SATO, Yutaro TANAKA, Daisuke YAMAGUCHI, Shuichi WAKIMOTO, Takefumi KANDA, Prototype Textured Polyimide Actuator and Micro-Robot, *SEAD35*, 0S2-4-1