Fabrication and Friction Properties of PDMS Pillars with Embedded Particles

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Soft PDMS, a synthetic rubber known for its adhesive properties, has previously been used in an effort to mimic the feet of geckos. However, soft PDMS has mechanical stability issues, like clumping and material strength. By dispersing Iron (III) Oxide into the PDMS sample, the stiffness is increased while the friction force remains unaffected.

Introduction

Macroscale

Meso- and Nanostructures

Geckos feet contain setae, which are responsible for the climbing properties of these animals. The fibrillar array conforms to the surface, which increases the Van der Waals force interaction.

Objective

- Many people have tried to mimic the feet of geckos with soft PDMS, a type of synthetic rubber.
- Soft PDMS sticks well, but there are some mechanical stability issues: clumping, material strength.
- We intend to create a stiffer PDMS by embedding Iron (III) Oxide particles in the sample.

Procedure

1g PDMS × grams of Iron (III) Oxide
Stir
Molding on Si Template
Vacuum eliminate bubbles
Oven cure ~60 °C, 2 hours
PDMS

Results

Made several samples with different weight percent of Iron (III) Oxide.

Changing the amount of curing agent used for the preparation of PDMS altered the stiffness of the sample.

Results show that as stiffness increases, the friction is not affected.

As pure PDMS becomes stiffer, the friction force decreases.

Conclusions

We successfully fabricated PDMS pillars with embedded particles.

Dispersed particles create a stiffer PDMS without affecting the friction force.

Future Work

- Confirm the dispersion of particles at micro scale.
- Perform reproducibility tests to decrease error bars.
- Test longer and thinner length fibers. Test and compare with previous work.

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