Sticking Together: Adhesion and How it Works

Kimberlie Dupiton

Adhesion

The tendency of dissimilar participles to cling to one another

vs.

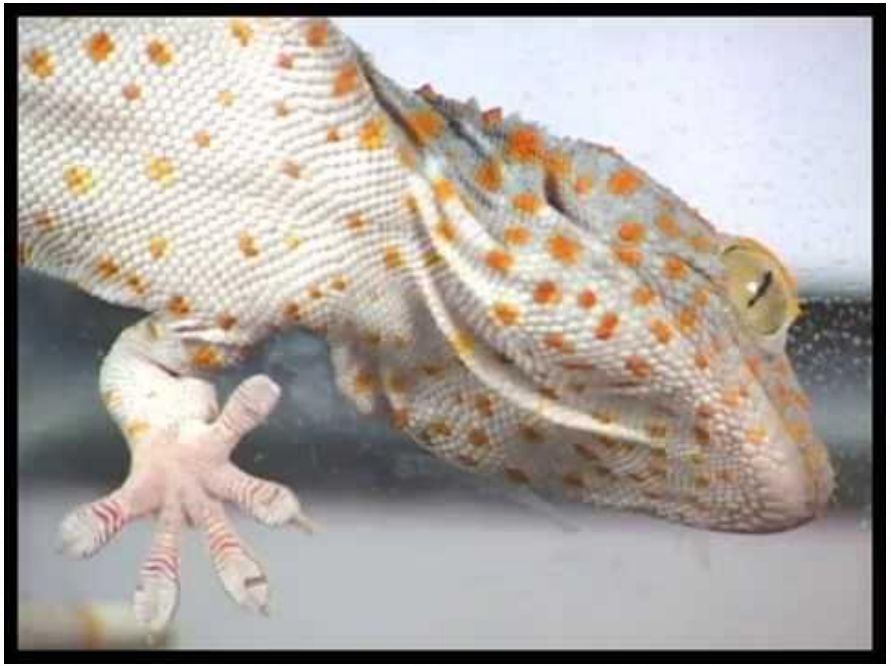
Cohesion

The tendency of similar or identical surfaces to cling to one another

Why is this Important?

- Adhesion and Cohesion are important qualities of water
  - Hydrogen bonding of polar molecules
- Plants wouldn't be able to survive without adhesion
  - Allows water to travel throughout a plant
- Cohesion holds the water together
  - Allows water to move upwards in the plant against gravity

How Nature Contributes to Present Day Research



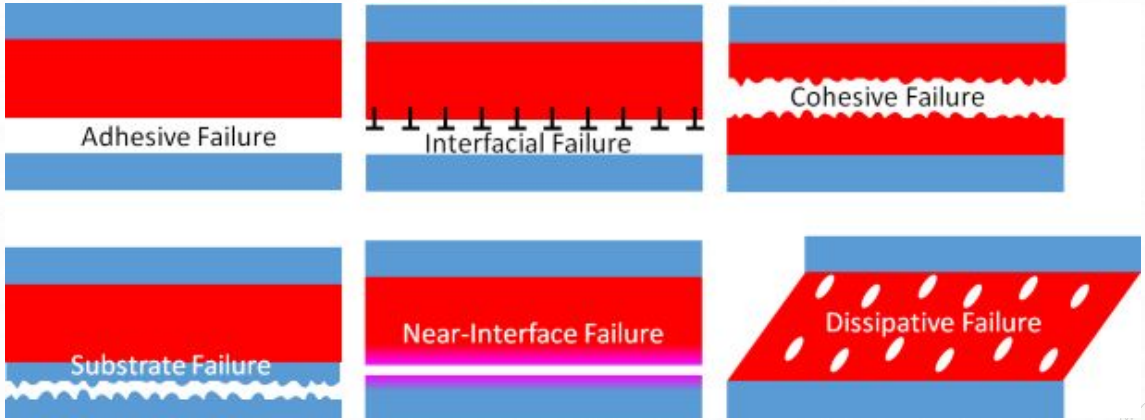
Important Terms and Units

- Work of Adhesion: work required to pull two surfaces apart (W)
- Peel force: the force needed to pull things apart along in a line (N/m)

What	Unit	Dimensions
Force	N	$kg.m/s^2$
Pressure	Pa = Force/Area = N/m^2	$kg/m.s^2$
Work = Energy	J = Force *Distance = $N.m = Pa.m^3$	$kg.m^2/s^2$
Surface Tension	N/m = 1000 dynes/cm	kg/s^2
	equal to	
Surface Energy	J/m^2 = 1000 $ergs/cm^2$	kg/s^2
Peel force	N/m	kg/s^2
	equal to	
Work of Adhesion	J/m^2	kg/s^2

Failure Modes

- Adhesive- failure at the interface
- Cohesive- failure within the adhesive
- Dissipative- failure after (large) absorption of energy within the adhesive system
- Structural- where mechanics rather than adhesion are the main issues
- Coherence- when a layer falls apart because it lacks self-coherence



Activity

Before the school dance, the committee is in a rush to finish hanging decorations in the main hallway. While working on the job a committee member noticed that they were running out of tape to finish the job so they called the other members to help find more tape in order to finish decorating. The team returned with a variety of different tapes ranging from medical bonage tape to electrical tape. The group wishes to know the adhesive properties of these tapes so that the decorations would not fall down before the pep rally.

Brainstorming Questions

- How are tapes alike?
- How are tapes different?
- Are they made out of the same materials?
- Do they all have the same stickiness?

Materials

- Tapes to display in the opener and for testing
  - Masking tape, duct tape, clear packing tape, medical bandage tape, cellophane tape, painters tape, and electrical tape
- Testing track
  - Marbles, measuring tape, books or blocks (for ramp), board approx. 12 in. by 24 in.
- Graphing paper

Demonstration

Shear Strength vs. Peel Strength

Questions

- What surprised you about the results?
- Did the data support your predicts?
- Which of the tapes chosen was the stickiest?

Thank you!

Questions?