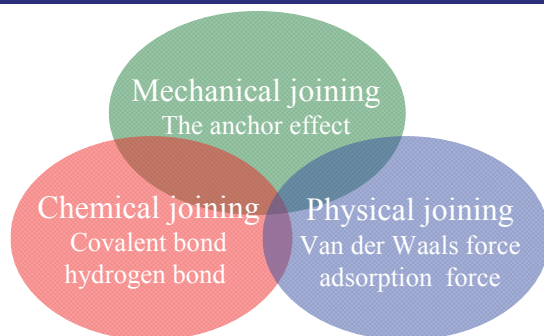


To control adhesion, lubrication and friction freely ! ~ Approach from the interfacial characterization ~

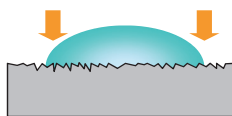
In designing a component, a device and a product, the interfacial characterization of the variety materials are an important parameter for securement of the durability, reliability and material selection. We mainly introduce here important factor, analytical method and practical approach example to adhesion between the surface of liquid and a solid matter.

Important factor of adhesion and compatibility



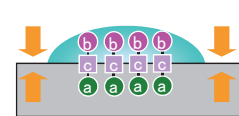
Mechanical joining

It's glued together by liquid's entering into the bump with the minute substrate material surface.



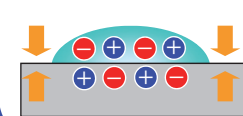
Chemical joining

It's glued together by chemical bonding between functional group of substrate material and liquid.



Physical joining

It's combined by the intermolecular force between substrate material and liquid.



Various factors are connected with adhesion.

Typical analysis about adhesion, lubrication and friction

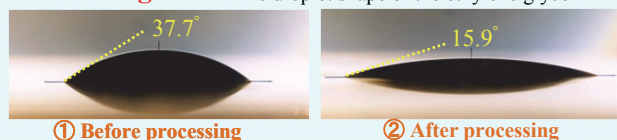
Items	Analytical method	Factor
Surface condition	OM, SEM, AFM, Roughness of the surface	Mechanical joining
Wettability	Contact angle, Surface tension, Surface free energy, Zeta potential, Immersion heat analysis	Mechanical, chemical and physical joining
Functional group in the surface	XPS, TOF-SIMS, FT-IR, Components of surface free energy	chemical and physical joining
Case of adhesive by melting and thermosetting		
Melting point, Degree of curing	DSC, Viscoelasticity, FT-IR(Thermal scanning mode)	chemical and physical joining

An approach example from the contact angle and the surface free energy

Change in the PET film surface condition by the corona discharge processing

Contact angle

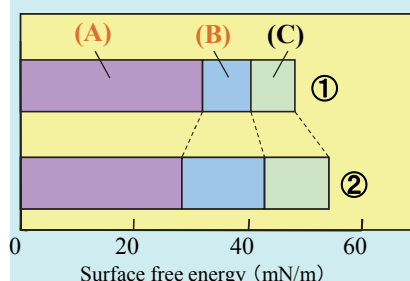
The droplet shape of the ethylene glycol



The contact angle to each liquid

	Ethylene glycol	Formamide	Diiodo-methane	Water
①	37.7°	48.3°	22.3°	65.5°
②	15.9°	29.9°	26.4°	54.0°

The surface free energy analysis is put into effect using the expansion Fowkes system from the contact angle of each liquid.



(A) Diffusion component
Participation of adhesion is weak

(B) Polar component
Participation of adhesion with the strong material of the polarity

(C) Hydrogen bond component
Participation of adhesion with the strong material of the hydrogen bond

Inspection of an analysis result by XPS

	O/C	-COH/C	-COOH/C
①	0.40	0.004	0.003
②	0.45	0.023	0.017

↓
Increase

Adhesion with the strong material of the polar component and hydrogen bond component improved by corona discharge processing.

A gecko is attached by the intermolecular force!!

