KKI **Eco-friendly Fluorine Free** Water and Oil Repellent Materials

New materials considering environmental problems "Very low sliding angle" or "high water and oil repellent" material



Background and targets

Wettability of solid surface has been evaluated by mainly measuring static contact angle. Recently, \checkmark removal property tends to be attention but only not static property as repelling droplets. In other words,

- *"dynamic property"* will become more noticeable as one of the most important factors.
- KRI has proceeded to develop the three type of F-free water and oil repellent materials.
- Different types of water and oil repellent materials with property of "very low sliding angle" and "high *oil repellent*" have been developed for targets corresponding to usage environment and use.

Characteristic of the present technology



Very high sliding property, Thermal resistivity

Sliding property, Very high thermal resistivity • Oil repellent type: High oil repellency

				DTEE		
PTFE			Hybrid type	Silicone type	High oil repellent type	PIFE
40	Water and	Static Contact angle	0	0	\bigcirc	\bigcirc
<u>40</u> 23	Oil Repellent	Dynamic Contact angle	0	0	×	×
<u>21</u> <u>43</u>	Therm	Thermal property		Ô	0	×
	Ha	Hardness Toughness		Ο	×	0
105 m.n	То			×	Ο	0
п.р. 327°С	Transparency		Ο	Ο	0	0
	Th	ickness	\bigcirc		\bigcirc	×

Property of Water and oil repellent films

			KRI film		
		Hybrid type	Silicone type	High oil repellent	PTFE
Sliding angle	HD,5 μ L	3	17	-	40
(deg.)	DW,20µL	29	22	-	40
Contact angle	HD,5µL	3	8	-	23
hysteresis	DW,20µL	18	14	-	21
Contact angle (deg.)	HD,2 μ L	37	36	68	43
	ΟΑ,2 μ L	50	59	104	53
	DW,2 μ L	101	102	107	105
pyrolytic temperature[°C]		231	530	275	m.p.
5wt% weight decrease[°C]		312	> 530	342	327°C

HD:n-Hexadecane, OA:Oleic acid, DW:Distillated Water



Proposal by KRI

Excellent slip property is effective for *"improving energy efficiency"* through decreasing interface sliding resistance but not only stain resistance, leading to solution of environment and energy problem. KRI will propose material development and their application corresponding to targets of various industry fields.

 \star Functional analysis, degradation analysis of various water and oil repellent materials \bigstar Improving of various water and oil repellent materials

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