

CYTONIX

FluorAcryl™ 6975 Product Information

Introduction

FluorAcryl 6975 is a recently developed proprietary UV-curable oleophobic resin system comprising Urethane and Acrylic Esters, which can be provided neat for screen printing or diluted in various fluorinated solvents for spin, spray or dip coating. The basic resin system can also be modified to increase flexibility, adhesion or other desirable properties. Applied to glass, metals, plastics and wood, FluorAcryl 6975 may be expected to provide exceptional and long-lasting anti-fouling from stains, fingerprints and other contaminants on commercial and domestic surfaces.

Principle contaminants of electronic appliances are fingerprints, and key measures of resistance to oil and fatty acid marking on surfaces are the contact and roll-off or sliding angles (degrees) to Mineral Oil or n-Hexadecane. A highly sensitive variation of roll-off angle is the roll-off speed (mm per minute) at or near the starting roll-off angle. Other contaminants are stains from tannin-containing materials, such as tea, coffee and red wine.

Contact angle measurements were made using a 60 cm digital level (Husky) and a 15 mpix EOS-50D Cannon digital camera. Photographs were taken at 30 cm with ambient light. Approximately 100-200 µl of Sigma-Aldrich light mineral oil was dispensed from a dropper bottle with care to assure minimal kinetic input. The variation in drop size was not regarded as a factor in the measured contact angle. Images were acquired at 5 degrees from the sample plane, introducing a small unfavorable error in image analysis (true angle are slightly higher than reported). The Samsung plastic windows are slightly bowed, resulting in a second unfavorable error of slightly more than 1 degree on both sides of the drop. It was necessary to position mineral oil drops at the apex of the bowed plastic window surface to avoid roll off.

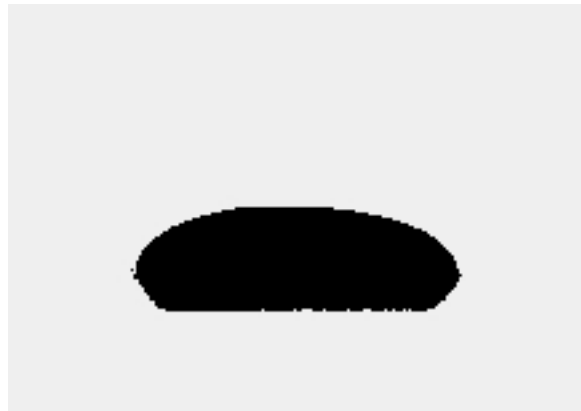
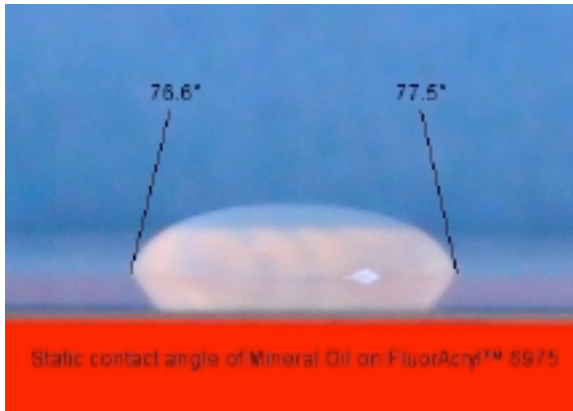
Images were processed using GraphicConverter™ and AppleWorks™, both Apple™ products. The black and white inverted (threshold 135) images may facilitate measurements. Images which were not level were rotated with no change to the image proportions.

Evaluation based on thick films

Coating	100% FluorAcryl resin
Application method	draw bar
Substrate	Glass microscope slides (25 x 75 x 1 mm)
Film thickness	50 microns
Cure source	48 watts/cm ² Mercury Lamp
Belt speed	6 meters/minute
UV dose	110 mj/cm ² .
Contact angle to mineral oil (degrees)	75°
Roll-off angle (degrees)	1.2°
Tabor CS17 1000 gram abrasion	< 105 mg after 2000 cycles
Tabor S33 500 gram wear through	> 115 cycles
MEK resistance	> 200 double rub cycles
Stain Resistance (ISO 4211, 5 = no stain)	5, 5, 5, 3 (tea, coffee, red wine, iodine)
ASTM D3363 pencil hardness	> 6H
Pendulum Hardness (ISO 1522)	> 300 seconds
Reverse Impact (inch/pounds)	< 2
Glass transition point (T _g)	118°C

Evaluation of thin films spun onto plastic cell phone windows

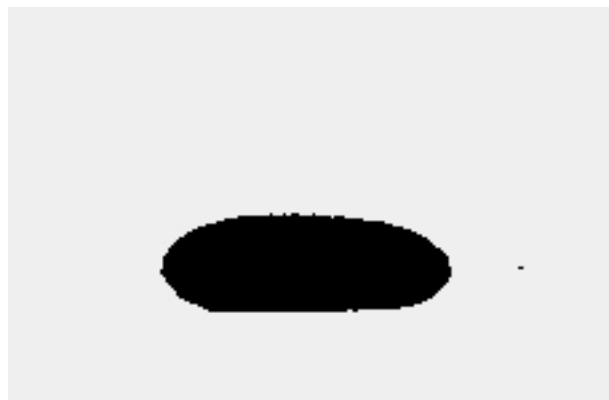
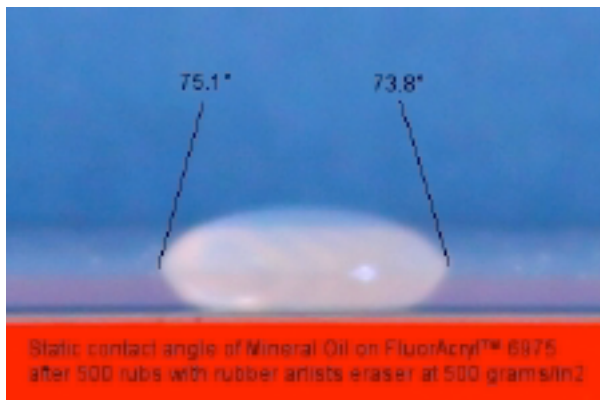
Coating	20% FluorAcryl 6975 diluted in Freon 225
Application method	spin coat
Flood	2/3 to full
Spin RPM	1500
Spin time	20 seconds
Dry time	1-5 minutes
Film thickness	5 microns
Cure source	48 watts/cm ² Mercury Lamp
UV dose	110 mj/cm ² .
Atmosphere	nitrogen



Initial contact angle to mineral oil (degrees)	76.6° to 77.5°
Roll-off angle (degrees)	0.6°
Rubs to remove Magic Marker with alcohol	1
Rubs to remove Sharpie Marker with alcohol	1
Appearance	Clear

Evaluation of thin films spun onto plastic cell phone windows after 500 rubs

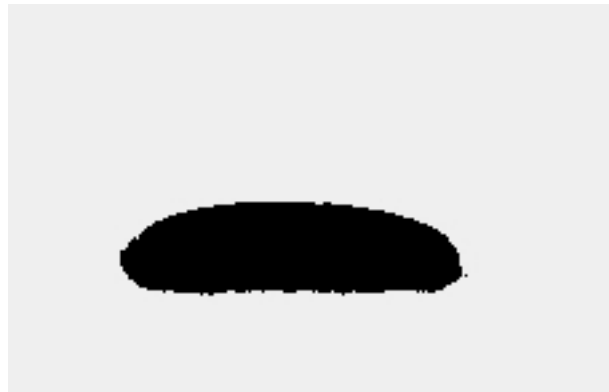
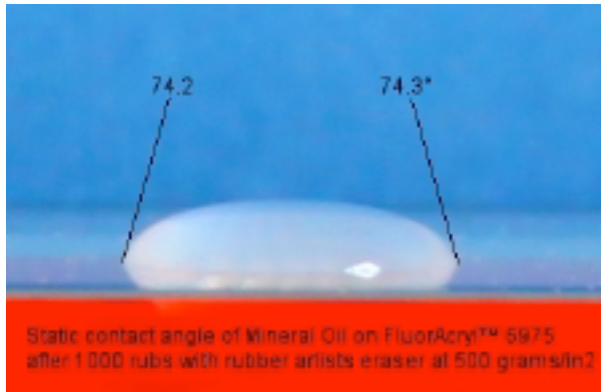
The spin-coated plastic substrate was rubbed 500 strokes with a Sanford ArtGum™ eraser at a pressure of 500 grams per square inch. Stroke distance was 3 cm, effectively 3 times the rub excursion of previous measurements (~1 cm).



Contact angle to mineral oil after rubbing (degrees)	75° to 73.8°
Roll-off angle after rubbing (degrees)	2.8°
Rubs to remove Magic Marker after rubbing	1
Rubs to remove Sharpie Marker after rubbing	1
Appearance	Clear, no sign of haze

Evaluation of thin films spun onto plastic cell phone windows after 1000 rubs

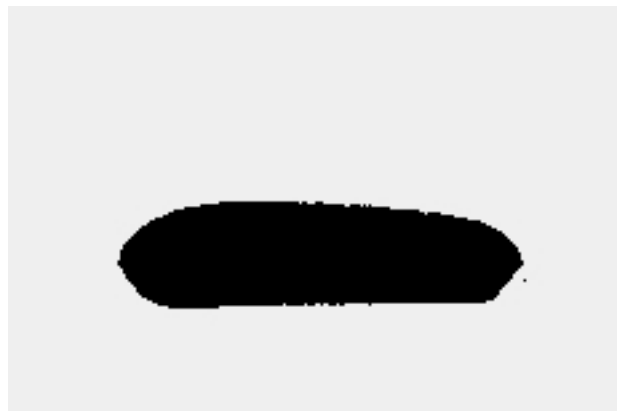
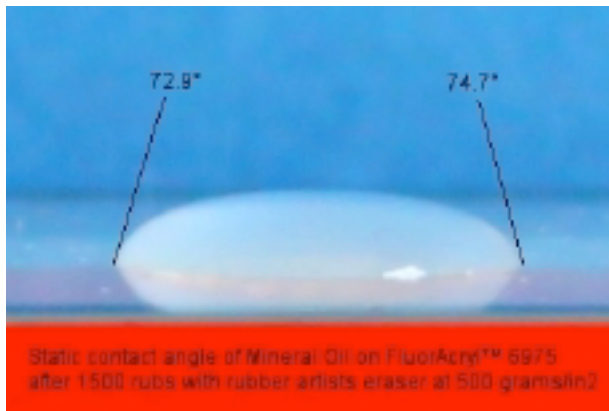
The spin-coated plastic substrate was rubbed 1000 strokes with a Sanford ArtGum™ eraser at a pressure of 500 grams per square inch.



Contact angle to mineral oil after rubbing (degrees)	74.2° to 74.3°
Roll-off angle after rubbing (degrees)	3.4°
Rubs to remove Magic Marker after rubbing	1
Rubs to remove Sharpie Marker after rubbing	1
Appearance	Clear, no sign of haze

Evaluation of thin films spun onto plastic cell phone windows after 1500 rubs

The spin-coated plastic substrate was rubbed 1500 strokes with a Sanford ArtGum™ eraser at a pressure of 500 grams per square inch.



Contact angle to mineral oil after rubbing (degrees)	72.9° to 74.7°
Roll-off angle after rubbing (degrees)	4.1°
Rubs to remove Magic Marker after rubbing	1
Rubs to remove Sharpie Marker after rubbing	1
Appearance	Clear, no sign of haze

Conclusion

These data predict a substantial resistance to abrasion and to stain and fingerprint contamination of FluorAcryl 6975 surfaces. The largest measurable performance losses were in roll-off or slip angles due to abrasion. As would be expected, even the slightest nano-scale induced roughness would produce some degree of contact angle hysteresis and increased roll-off angle. Even after such harsh treatment, however, all contact angles remain comparable to the best of other coatings unchallenged by abrasion.

Contact:

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