Car Care Empowered with Specialty Silicones from Siltech Corporation

Agenda

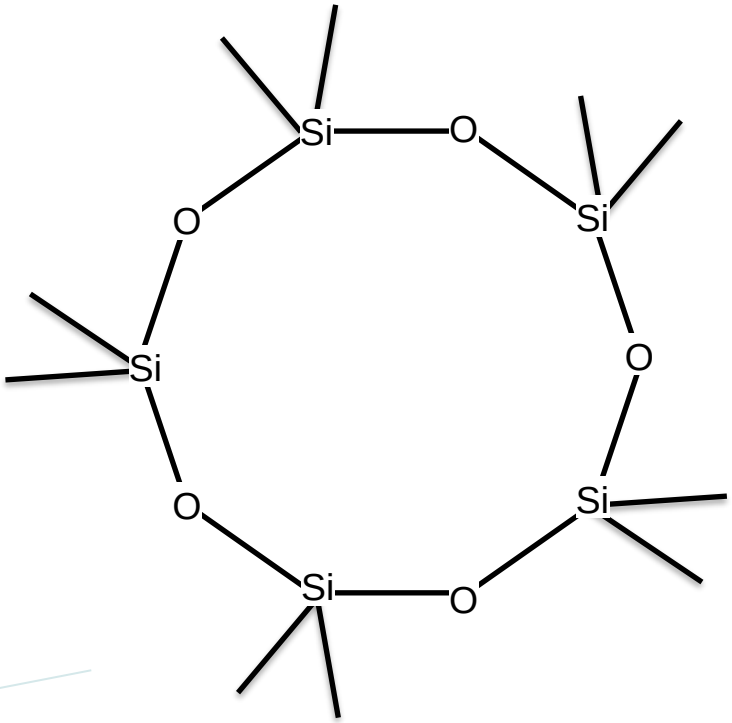
- Products (Standards)
  - Volatile Silicones
  - PDMS
  - Aminosilicones
  - Emulsions
- Products (Specialties)
  - Silwax® Methyl Alkyl Silicones
  - Silsurf® Copolymers
  - Silube® unique hybrids
  - Fluorosil® fluorinated silicones
  - Silmer® Resins
- Formulation Guidelines and Applications Data
  - Tire and Vinyl Dressings
  - Car Washes
  - Windshield and Windshield Washer Solutions
  - Glass Cleaner and Anti-fog

Products

Volatile Silicone Fluid

- Product: Siltech® CF-955
- Chemical name: *Decamethyl cyclopentasiloxane*
- Common Name: D_5

- VOC compliant [non-HAPS]
- Substitute for organic solvents



PDMS: Two Viscosities

Regular

- Products:
  - Siltech® F-350 PDMS
  - Siltech F-1000 PDMS
  - Siltech S-701 silanol
- Benefits:
  - Improved wipe-on/ wipe-off
  - Better leveling
- Drawbacks:
  - Less “depth of color”
  - Gloss could be better

High

- Products:
  - Siltech F-10,000
  - Siltech F-60,000
  - Siltech S-702 silanol
- Benefits:
  - High gloss
  - Provide “depth of color”
- Drawbacks:
  - Difficult rub-out
  - Less uniform film

PDMS: Emulsions

Siltech®	PDMS	Actives
E-600	F-60,000	35%
E-660	High/low blend	60%
E-2140	F-350	60%
E-2145HG	S-701	60%

- Benefits:
  - Same as PDMS but delivered in water
  - Diluted to base tire and vinyl dressings

Silamine® Products

Wax soluble

Silamine®	Actives	MW	Amine value
STD-50	100%	4,000	3.2
STD-100	100%	60,000	1.6
DG-50	50% Min Sp/ IPA	28,000	16

Water Soluble

Silamine®	Actives	MW	Amine Value
D2 EDA	100%	1,700	250
A0 EDA	100%	400	230

- Benefits:
  - Similar to PDMS but with enhanced durability

Siltech® Film Forming Emulsions

Product	Actives	Degree of film forming	Unique family properties	Individual differentiation
Siltech E-4155	35%	Highest	Amine groups for anchoring to surfaces and providing durability, imparting softness and providing long lasting lubricating effect.	Most durable, fast cure
Siltech E-2150	35%	High		Most durable
Siltech E-2151	50%	Medium		More durable
Siltech E-2972	60%	Low		Good balance
Siltech E-2155	30%	Lower		More flexible
Siltech E-2145	60%	None		Most flexible
Siltech E-2152	50%	Medium	More water repellence, more rubbery feel, neutral, non-yellowing	Slightly more water repellent
Siltech E-2178	40%	Medium		
Siltech E-2158	50%	Medium		Less oil miscible
Siltech E-2154	50%	Medium	High gloss	
Siltech E-2188	40%	Medium	Anchored and durable with gloss	

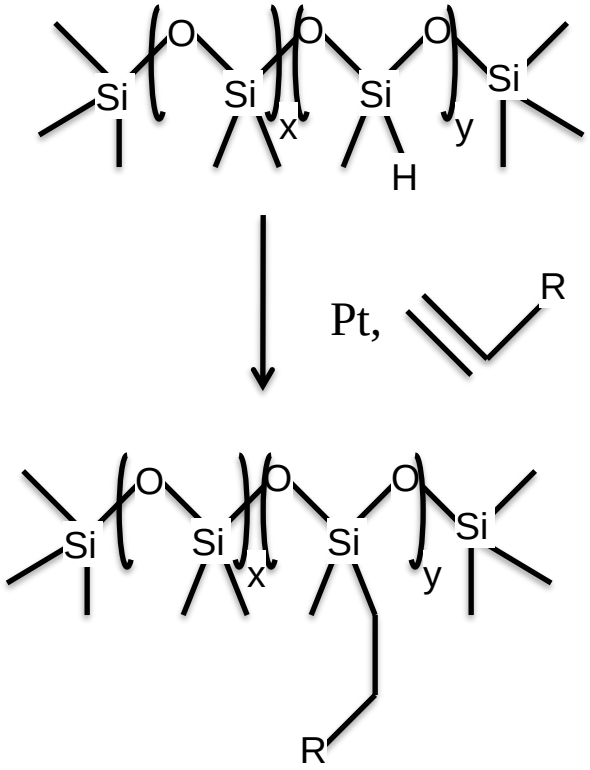
- Benefits:
  - Highly durable gloss and beading

Antifoam Compound & Emulsions

Siltech®	Actives	Type	Application
Siltech 2200	100%	Non-aqueous	Waxes
Siltech E-2211	10%	Strong Aqueous	Washes
Siltech E-2231	30%	Strong Aqueous	Washes
Siltech PA-140	100%	Emulsifiable	Concentrates
Silsurf Di-2510	100%	Weak aqueous	Bottle filling

- Benefits:
  - Used in small quantities to control foam in bottle filling, mixing and other areas

Hydrosilation Reaction: Specialty Silicones



Vinyl-R	Siltech Product
Hydrocarbon	Silwax®
Polyether	Silsurf®
Fluoroalkyl	Fluorosil®
Alkyl Amine	Silamine®
Alkyl Quaternium Ammonium Salt	Silquat®

Silwax® alkyl, aryl derivatives

Silwax®	Benefit	MP (ºC)	% Alkyl
D02	Wetting of waxes	< -20	20
D0-MS	High Gloss	< 25	55
3H-MS	High Gloss	< 25	65
Siltech® E-3132	Silwax 3H-MS emulsion for water-based	< 25	65
3H12-MS	Gloss and stabilizing	< 25	70
L118	Spreading, lubricity, feel and gloss in liquid polishes	30	65
D3026		35	15
J219M	Rubout and gloss	30	55
D221M		35	53
D222	Spreading, lubricity, feel and gloss in soft waxes	37	55
J1026		46	30
J226	Spreading, lubricity, feel and gloss in hard waxes	51	60
D026		65	55

"M" or Multi Domain alkyls have soft and hard groups to give best of both benefits

Silsurf® and other Surfactants

Silsurf	Benefit
Silsurf A008-UP	Maximum wetting, anti-fog, sheeting, strong pro-foaming
Silsurf A004-UP	Maximum wetting, anti-fog, sheeting, non-foaming
Silsurf A208	Strong wetting, sheeting, anti-fog, non-foaming
Silsurf B608	Good wetting, sheeting, anti-fog, non-foaming
Silsurf J1015-O	Good sheeting, anti-fog, Strong pro-foaming
Silsurf J208	Sheeting, anti-fog, Strong pro-foaming
Silsurf Di-2510	Foam elimination control
Silsurf CR 1115	Compatibilizer
Silplex® JQ-40	Mild surfactant, detergent
Silphos® J208	Anionic Silicone Detergent

- Benefits:
  - Sheeting
  - Wetting
  - Anti-fog
  - Water spot preventer
  - Formulation stabilizer
  - Foam impact

Silube® alkyl polyether products

Silube®	Use	Visc (cps)	% alkyl	% EO	Water (1/10%)
T308-16	w/o emulsifier	800	30	12	I/I
FF108-16	o/w emulsifier	1500	10	60	S/S
J208-212	o/w	1000	6	48	S/S
J208-412	o/w, degreaser	800	13	39	D/D
J208-612	w/o; ester/o	600	22	28	I/I
J208-812	w/o	300	32	16	I/I

- Benefits:
  - Emulsification
  - Formulation stability
  - Degreaser

Silquat® products

Silquat®	Benefits
A0	Water soluble quats: spreading, leveling, wetting, anti-stat
D2	
J2	
J15	Water repellent, cheater wax, windshields
J15-B	As J15 but higher contact angle
1105B	Formulated water repellent for windshield washer solutions
3152	Water soluble blend of fatty and silicone quats
3150, 3180	Water Dispersible blends of fatty quats and silicone quats for beading. Waxes, cheater waxes.
3450, 3452	
Silube® 12	Formulated Windshield Rain Repellent

Fluorosil® products

Fluorosil®	Benefit	Visc. (cps)	% Fluoro	% alkyl	% EO	Water solubility (1/10%)
J15	Water insoluble, superior beading, water repellency, stain resistance	500	17	0	0	I/I
D2		50	48	0	0	I/I
Silwax® F	Fluoro alkyl with high silicone	NA	10	3	0	I/I
2110	Water soluble. Sheeting, anti-fog, water spot prevention	300	8	0	55	S/D
2010		800	3	0	70	S/S

- Benefits:
  - Water insoluble are similar to PDMS but more beading, repellency, stain resistance
  - Water soluble are similar to Silsurf products but often superior

Silmer® Resins

Product	General Use
Silmer Q9-30	High cross-linked resins in solvent. Used for water and stain repellency and softness.
Silmer Q12	
Silmer Q20	100% active solid resins. Useful for anti-squeak, lubricants, softness and water and stain repellency
Silmer Q25	
Silmer Q30	
Siltech E-2199	Excellent water repellency from Emulsion

- Benefits:
  - Beading, Water Repellency
  - Lubricity, Anti-Squeak

Formulations Guidelines and Applications Data

The following are not tested, final formulations but are instead guidelines based on our experiences, understanding and knowledge. Please develop and evaluate any products to your criteria for performance and stability.

Vinyl Dressings

Windshield Beading Treatments
- DIY Applied
- From Windshield Wash

Antifog

Cheater Waxes for Beading

Waxes and Polishes

Sheeting Agents for Car Wash

Tire Dressings

Guidelines for Solvent Based Tire and Vinyl Dressings

Product	Percent
Siltech® F-350	15-26%
Siltech F-1000	0-13%
Siltech F-10000	2-4%
Solvent	70%

- Mix and match as below to approximately 30% total actives
  - Replace F-350 with F-1000 for better rubout
  - Use a small amount of F-10,000 or F-60,000 for gloss
  - Add Silwax® D0-MS or Silwax 3H-MS for higher gloss enhancement
  - Add Silamine® or Silquat® products for durability and anti-sling

Guidelines for Aqueous Tire and Vinyl Dressings

Product	Property
Siltech® E-2140	Most Basic Formula
Siltech E-2145HG	Higher Gloss and Durability
Siltech E-4155	Durable and soft, quick cure
Siltech E-2150	Most Durable
Siltech E-2151	Durable
Siltech E-2155	Flexible
Siltech E-2145	Most Flexible
Siltech E-2154	High Gloss
Siltech E-3132	High Gloss
Siltech E-2188	Gloss and Durable

- Mix and match for desired properties
  - Durability for anti-sling
- Add Silsurf® A008-UP, A208 or B608 to eliminate legs
- Dilute to about 5% actives
  - May need to add thickeners, freeze thaw additives or biocides for long term stability

Car Washes

- Use nonionic or anionic base detergents at 50%
  - Alternatively Silplex® JQ-40 or Silphos® J208 can be part of the surfactant package
- Add up to 5% water dispersible Silamine® or Silquat® products for beading, shine, or cheater wax claims
- Add up to 1% Silsurf® B608, A008-UP, or A208 Surfactant for self-drying and non spotting claims
- Use 100 - 500 ppm of defoamers, if needed, to control foam.
- Use about 1% Silsurf J1015-O or J208 to stabilize foam if desired.

Tunnel Wash with Beading

Ingredient	Level
Silquat® 3180, 3152 or PR-1145	4%
Silsurf® 1308	1%
Silsurf A008-UP	0.5%
Silquat J2-8B	0.5%
Tomah 4HF	10%
Tomadol 900	20%
Water	64%

Blend all ingredients until uniform.
Dilute 1:100 with water.

Car Rinse Concentrate

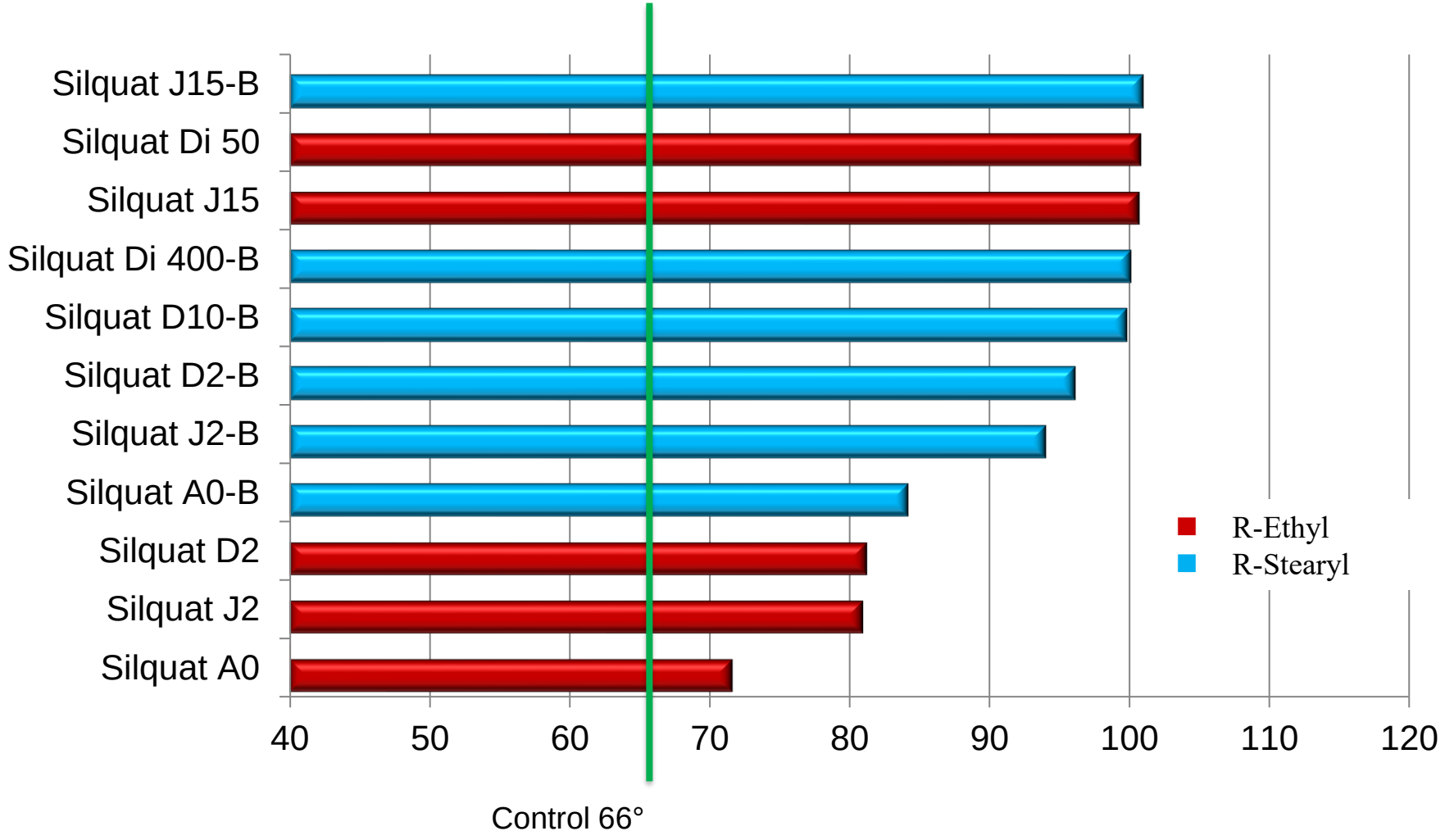
Ingredient	Level
Silamide® CDO	6
Silquat® 3152 or 3180	3
Silsurf® E418-F	3
D_5 Cyclics	6
Propylene Glycol	27
Water	55

Blend all ingredients until uniform.
Dilute 1:200 with water.

Windshield Water Repellent Treatment

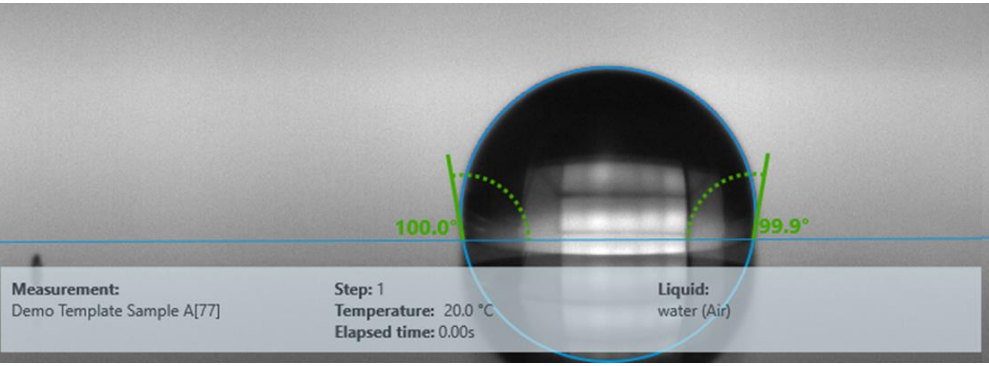
Component	Use level	Benefit
Silube® 12	~10-15%	Hydrophobic coating
Tetraethyl orthosilicate or organofunctional trialkoxy silane	~ 0.5%	Cross linker
Isopropyl Alcohol	q.s.	Solvent
Acetic acid or stronger	0.1%	Catalyst
Water	1-2%	Reactant

Contact Angle of Silquat® Products on Glass

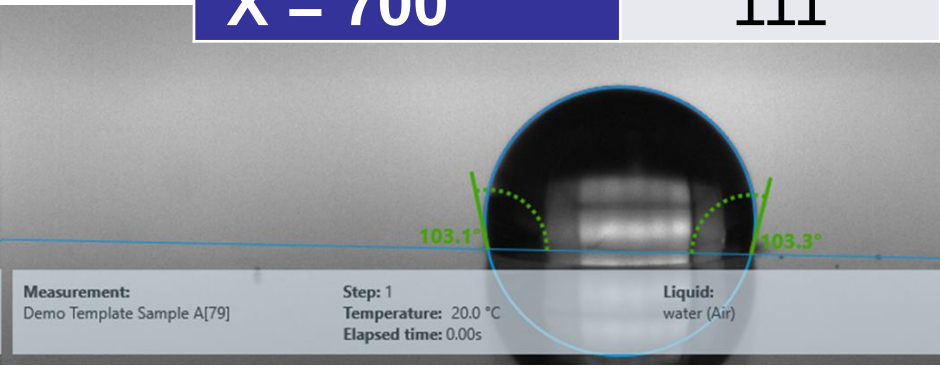


Silmer TMS Di-x on Glass

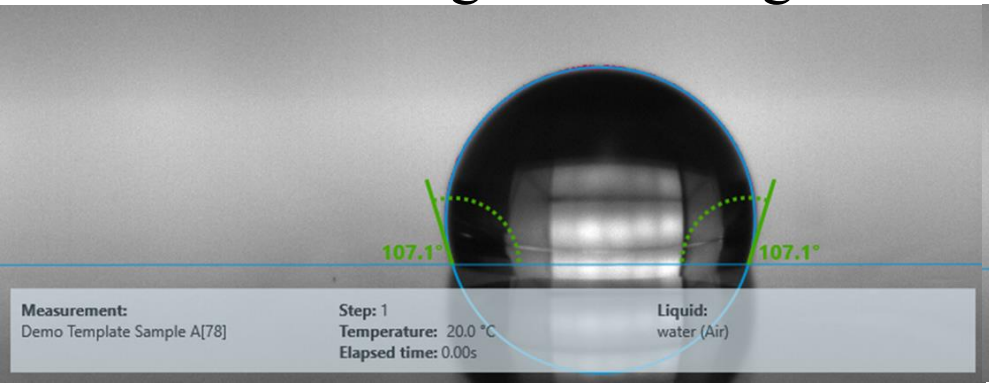
Structure	Angle (°)
X = 0	100
X = 10	103
X = 50	107
X = 100	109
X = 400	115
X = 700	111



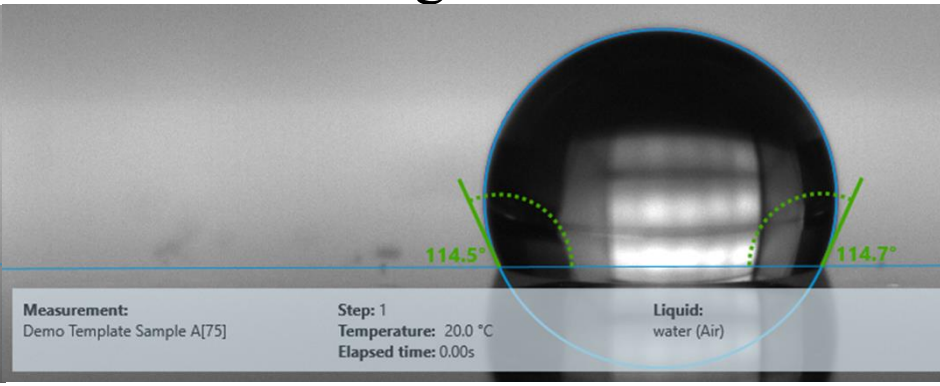
X=0 angle 100° on glass



X=10 angle 103°

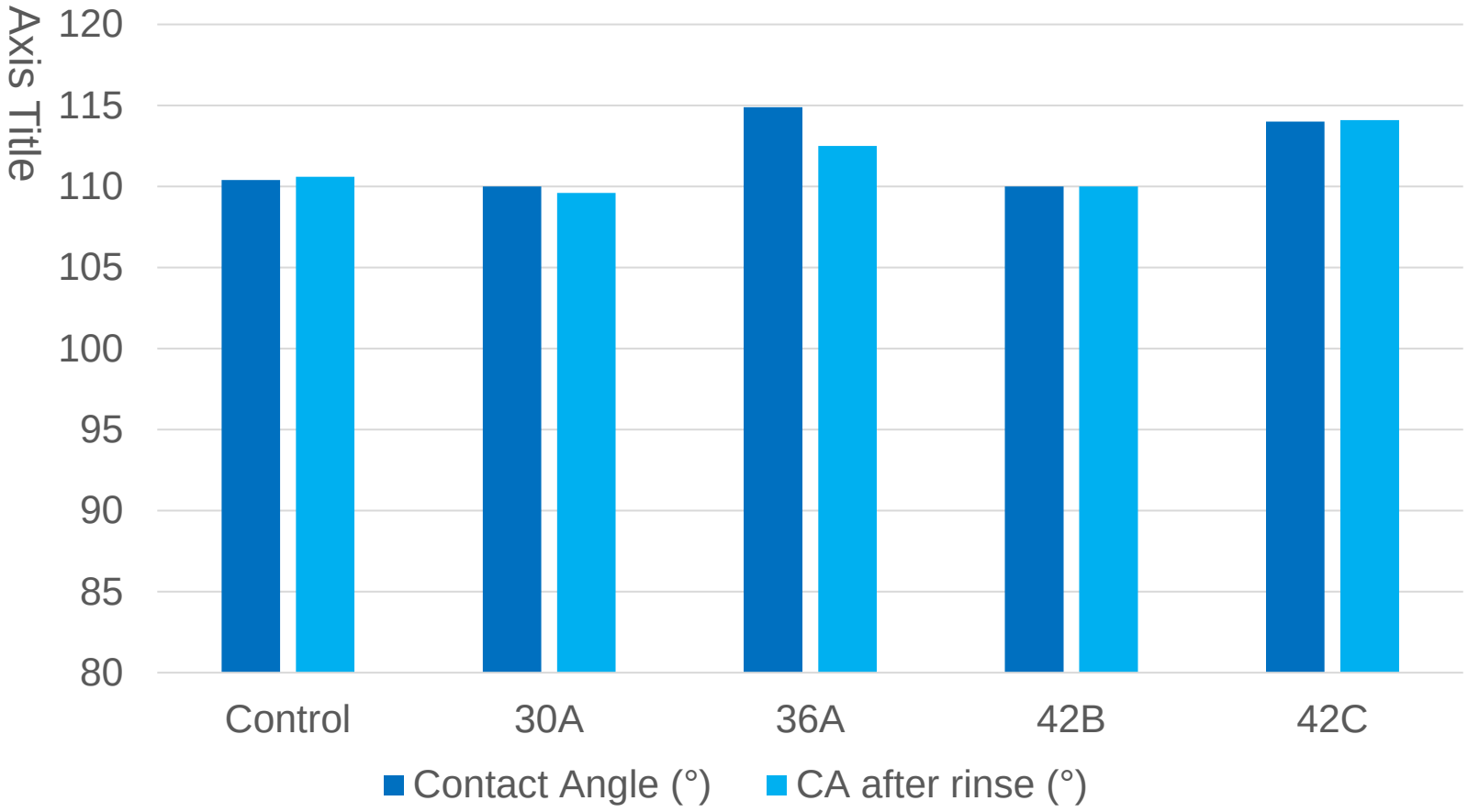


X=50 angle 107°



X=400 angle 115°

Silmer QT9-30 example formulations compared to OTC DIY ceramic treatment



Durability is determined by contact angle lost after rinsing under a 25℃ flow of water for 1 minute.

Pet Safe Windshield Washer Solution

Component	Percent	Benefit
Dipropylene Glycol Methyl Ether	0 - 5%	Medium Evaporating Solvent
Propylene Glycol Methyl Ether	0 - 15%	Slow evaporating solvent
Isopropyl Alcohol	15 - 35%	Fast Evaporating Solvent
Nonionic surfactant or Silplex JQ-40	0 - 1%	Detergent
Silquat® 1105-B	0 - 0.1%	Beading, release
Silsurf® Surfactant	0 - 1%	Spreading, Coverage
Silsurf or Siltech® foam control agent	~0.05%	Foam Control
Water	q.s.	Carrier

- Mix and match: target 35% solvent, 65% water as base
  - Add detergent, if desired.
  - Add Silsurf products for improved wetting and coverage
  - Add Silquat for beading and release of bug and other stains
  - Add foam control agent if needed for bottle filling

Glass cleaner with anti-fog

Component	Use Level	Benefit
IPA	0 - 60%	Fast evaporating solvent and cleaner
Glycol ether type	1 - 15%	Cleaner
Detergent or Silplex® JQ-40	0 – 1%	Detergent
Silsurf® surfactant	0.1 - 1%	Anti-fog
Siltech® or Silsurf foam control agent	0 - 0.1%	Foam Control
Water	q.s	Solvent

- For base target 50-75% solvents, 25-50% water, mix/match
  - Add detergent, if desired.
  - Add Silsurf products for improved coverage and anti-fog
  - Add Foam control if needed for bottle filling

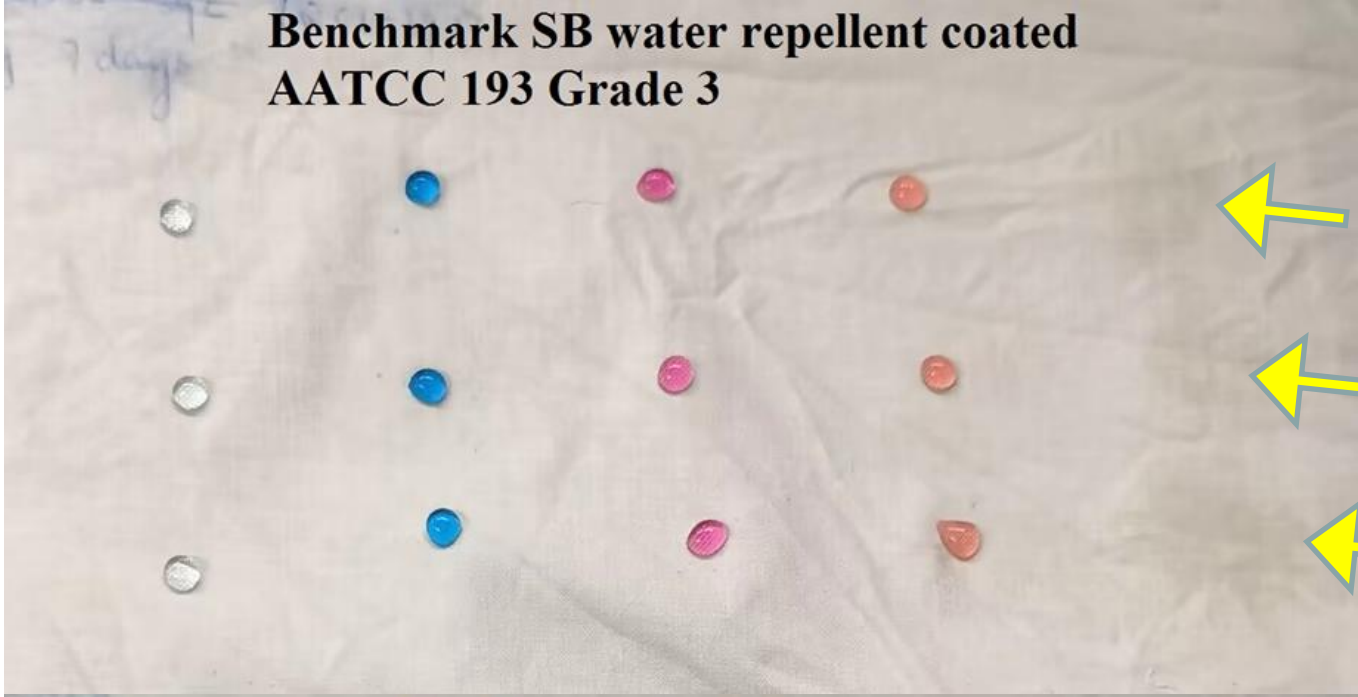
Fabric Treatments Silmer QT9-30 Sol-Gel Experimental

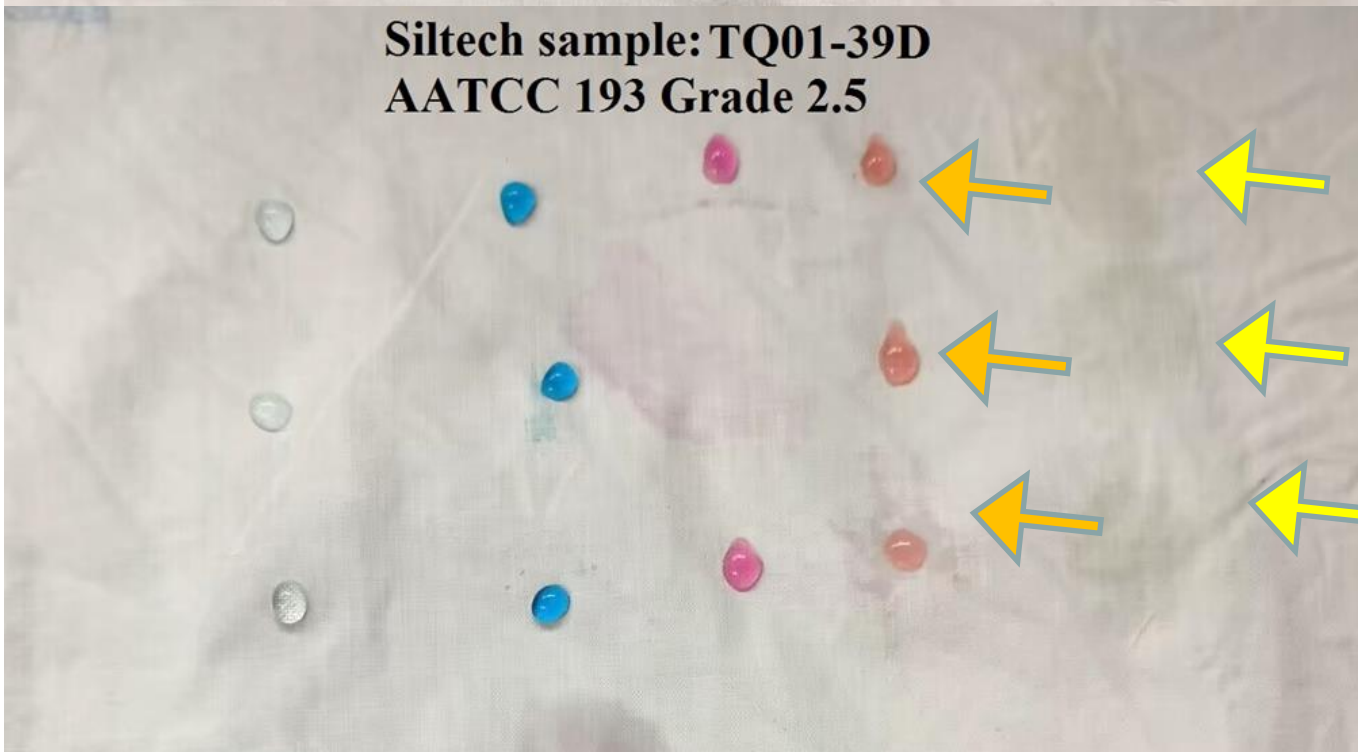
- Prepare 10% dilution of sol-gel sample (in ethanol), water, and glycol ethers. and coat on untreated cotton fabric
- Dry the cotton fabrics by using the following methods.
  - Heat 105°C oven for 4 hours or
  - Dried at RT for 7 days
- Perform AATCC 22 spray test, and softness before and after rinsing with water.
- Perform AATCC 193 aqueous liquid repellency test.

Sol-Gels of Silmer QT Resin (WB but no Emulsifier)

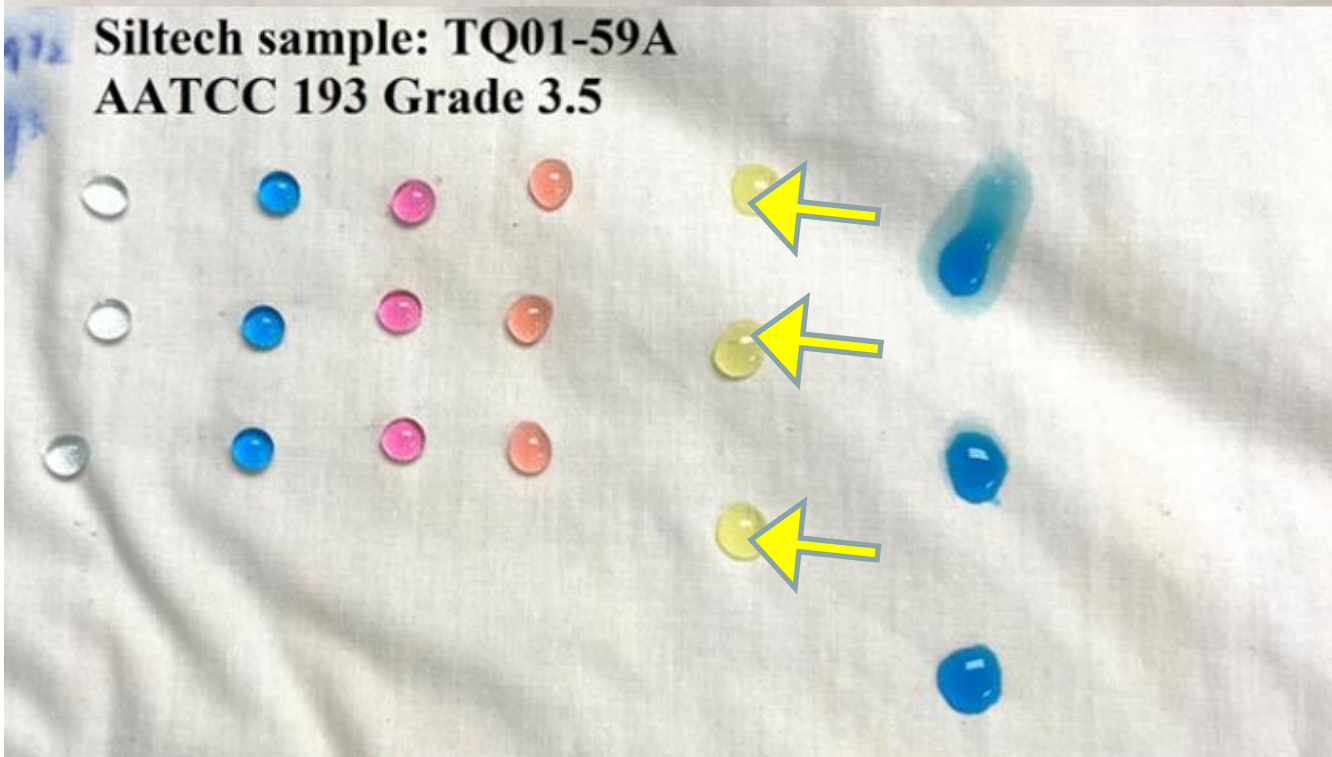
Sample	Description	AATCC 22 Rating	AATCC 193 Rating
Control	Commercial product	75	3
87F	Sol-gel base	70	na*
55A	Sol-gel + QT resin	70	na
39D	Sol-gel + QT + aminosilicone 1	70	2.5
59A	Sol-gel + QT + aminosilicone 2	70	3.5

Silmer QT9-30 Resin Sol-Gel formulation 39D on fabric





Silmer QT9-30 Resin Sol-Gel formulation 59A on fabric



Your Technology –
Our Chemistry