

Modified amino silicones for enhanced finishes

The challenge of optimum handle and comfort in apparel fabrics.

Dr. Naresh M. Saraf, FRSC, FSDC, FTI, FAIC, Saraf Chemicals Ltd., India, details a recent study of modified amino-silicones.

Silicones have been responsible for giving super softness to fabrics over the years, and the quest to produce the optimum handle for apparel fabrics with suitable comfort properties has presented an interesting challenge. Silicones and their modifications – dimethyl silicone, methyl hydrogen silicone, amino silicone, polyether modified silicone, epoxy, carboxyl, amide, etc. – give varying softness with different comfort properties. Amino silicones are known to impart extremely soft handle but suffer from problems of yellowing, hydrophobicity, drapability, etc.

A recent study compared the performance of four modified amino-silicones - 1. modified piperidine functional polysiloxane (Sarasoft 485); 2. reactive monoamino silicone (Sarafinish 655); 3. oxirane modified silicone (Supertouch SEP); and, 4. alicyclic modified silicone (Sarasoft 478) all of Sarex Overseas, India - with amino silicone (amino

ethyl amino propyl silicone).

Three fabric types were used - 100% cotton; a 65/35 polyester/viscose; and a 65/35 polyester/cotton - scoured and bleached and padded with - 50 gms per litre each of amino silicone. The padded fabrics were dried and cured at 150°C for 45 seconds in the case of cotton, and at 180°C for 30 seconds for the blends.

Finished fabrics were evaluated for handle₁, drape₂, whiteness index₃, tensile strength₄, crease-recovery angle₅, absorbency₆ and pilling₇.

Handle. In the case of cotton and polyester/cotton the piperidine functional silicone gave the best softness (Figure 1). This was followed by reactive monoamino silicone. In fact, the traditional amino silicone came fourth or fifth in the case of all the substrates. The results were confirmed by subjective methods of evaluation.

Drape coefficient. With cotton the drape coefficient was best with the piperidine

functional silicone followed by the reactive monoamino silicone. The amino silicone ranked last for cotton and polyester/viscose. The alicyclic modified silicone gave good results with polyester/cotton and polyester/viscose, whereas the oxirane modified silicone gave moderate results (Figure 1).

Whiteness index. The conventional amino silicone caused the maximum yellowing of all the substrates studied whereas the piperidine functional silicone and the alicyclic modified silicone showed the least yellowing in all the substrates (Figure 2). Sarasoft 485 and Sarasoft 478 could be practically considered as non-yellowing as the whiteness index showed hardly any change compared to the control fabric. The reactive monoamino silicone also showed good tolerance.

Crease-recovery angle (CRA). The amino silicone and alicyclic modified gave the best CRA in 100% cotton

Figure 1. (below) Handle and drape effectiveness.

Figure 2. (below right) Whiteness index.

Sr. No.	Fabric Treated with	Handle on Zwick Tester		Drape efficient	
		Hand Value F Max MN HV	Δ HV	F%	Δ F%
	A. 100% Cotton				
1	Control	1349.2	—	46.7	—
2	Conventional amino silicone	968.9	380.3	46.6	0.1
3	Sarasoft 485	824.1	524.9	44.5	2.2
4	Sarafinish 655	969.9	479.1	44.8	1.9
5	Supertouch SEP	946.8	402.2	46.5	0.2
6	Sarasoft 478	997.3	351.7	46.4	0.3
	B. 65/35 PET/VIS Blend				
1	Control	900.8	—	32.4	—
2	Conventional amino silicone	863.9	36.9	32.3	0.1
3	Sarasoft 485	745.1	155.7	32.2	0.2
4	Sarafinish 655	678.9	221.9	31.0	1.4
5	Supertouch SEP	826.1	74.8	31.3	1.1
6	Sarasoft 478	874.1	26.7	31.5	0.9
	C. 65/33 PET/COT Blend				
1	Control	1933.6	—	42.3	—
2	Conventional amino silicone	1162.8	770.8	40.1	2.2
3	Sarasoft 485	1063.7	869.9	40.1	2.2
4	Sarafinish 655	1130.4	803.2	40.4	1.9
5	Supertouch SEP	1064.3	849.3	40.8	1.5
6	Sarasoft 478	1200.8	733.6	39.3	3.0

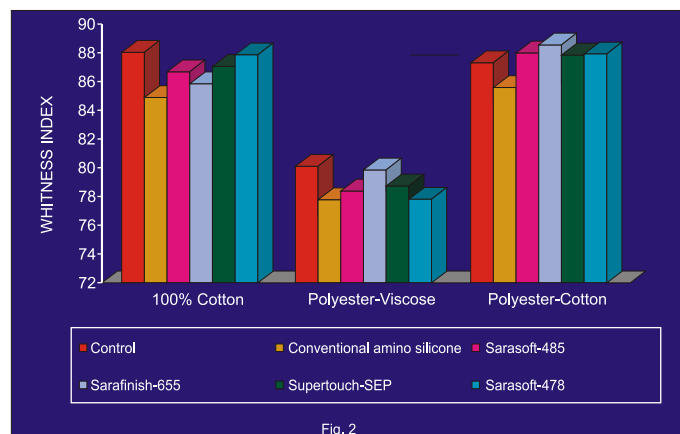


Fig. 2

whereas in polyester/viscose the amino silicone and reactive monoamino silicone gave the best CRA (figure 3). In the case of polyester/cotton, the reactive monoamino, silicone and alicyclic modified silicone gave better CRA compared to the rest.

Tensile strenght. For cotton the oxirane modified silicone gave the least fall in tensile strength followed by the amino silicone, whereas in polyester/viscose the oxirane modified leads, followed very closely by the piperidine functional silicone and reactive monoamino silicone (Figure 4). With the polyester/cotton blend the piperidine modified silicone and oxirane modified gave the least fall in tensile strength.

Absorbency. The piperidine functional silicone and the alicyclic functional silicone gave

the best absorbency in all three substrates, whereas the conventional amino silicone and reactive monoamino silicone imparted the maximum hydrophobicity to the fabric (Figure 5).

Pilling. The pilling rating (Figure 5) shows no changes in the case of cotton and polyester/viscose, but with polyester/cotton it indicates a drop with the amino silicone.

The study clearly showed that the piperidine functional silicone imparted the optimum properties of handle,

drape, whiteness index and absorbency. This was followed by the reactive monoamino silicone and the oxirane modified silicone.

References

1. Method recommended by sultan & Grover's (Zwick tester), Textile Horizons, July 1992, p34.
2. Drape coefficient, estimated as per IS.8357-77 using BTRA Drapemeter.
3. Macbeth Spectrometer by using Berger's equation.
4. ASTM Method D-5034.
5. Monsanto Tester, AATCC test method No 66-1968.
6. AATCC test method 79-1995.
7. BS Standard 5811-1986.

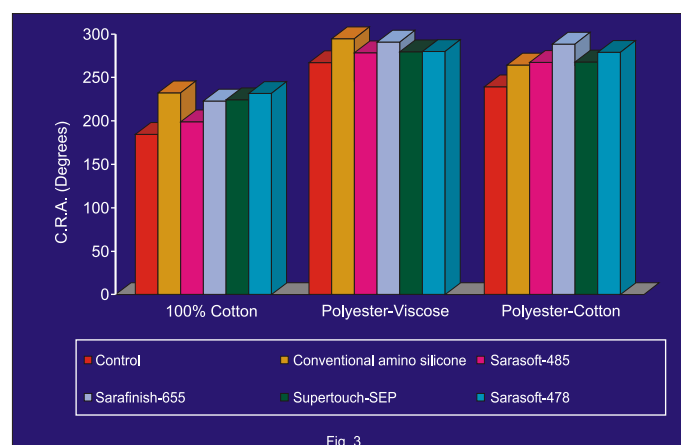


Fig. 3

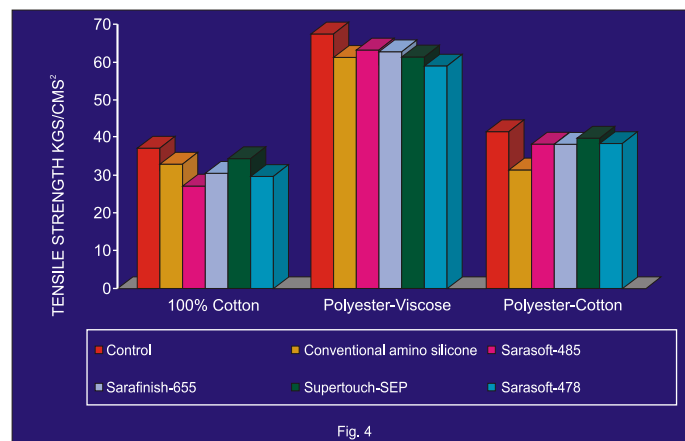


Fig. 4

Sr. No.	Fabric Treated with	Absorbency in Sec.	Pilling Rating
A. 100% Cotton			
1	Control	3	4
2	Conventional amino silicone	>25	4
3	Sarasoft 485	6	4
4	Sarafinish 655	>25	4
5	Supertouch SEP	8	4
6	Sarasoft 478	10	4
B. 65/33 PET/VIS Blend			
1	Control	7	4
2	Conventional amino silicone	>25	4
3	Sarasoft 485	6	4
4	Sarafinish 655	>25	4
5	Supertouch SEP	>25	4
6	Sarasoft 478	4	4
C. 65/35 PET/COT Blend			
1	Control	4	4
2	Conventional amino silicone	>25	2
3	Sarasoft 485	12	2-3
4	Sarafinish 655	>25	2-3
5	Supertouch SEP	>25	3
6	Sarasoft 478	16	3