



Copolymers that Unlock Opportunities

Selvol Ultiloc is a series of patented copolymers that expand on the functionality of industry trusted Selvol Polyvinyl Alcohol products. These new grades offer a variety of characteristics ranging from higher adhesion and crosslinking, to faster dissolution and low temperature solubility when compared to traditional polyvinyl alcohol products. Selvol Ultiloc copolymers can bring added efficiency and improved utility to applications including adhesives, emulsions, construction, coatings, flexible packaging, and many innovative application segments still on the horizon.

Sekisui Specialty Chemicals is dedicated to providing chemical solutions for the future. We own several key patents that support the Selvol Ultiloc technologies.

Patents

Product	Related Patents
Selvol Ultiloc 5103	US5300566*
Selvol Ultiloc 5003	US9271920, EP2326674, JP5669738
Selvol Ultiloc 4005	US10144810
Selvol Ultiloc 2012	US6818709, US7745517, US8772220, US9142835

*Patent owned by University of Pittsburgh

Ultiloc Series

Product	Viscosity (cps) ¹	Degree of hydrolysis (mol %)	Volatiles (wt% max)	VOC (wt% max)	Ash (wt% max) ²
Selvol Ultiloc 5103	5.0-10.0	Fully h.	5	3.0	1.5
Selvol Ultiloc 5003	5.0-10.0	Fully h.	5	3.0	3.0
Selvol Ultiloc 4005	9.0-10.0	Fully h.	5	3.0	1.2
Selvol Ultiloc 2012	10.0-14.0	Fully h.	6	2.0	3.5

1. 4% Aqueous Solution, 20°C

2. As % Na₂O, Corrected Volatiles



SEKISUI

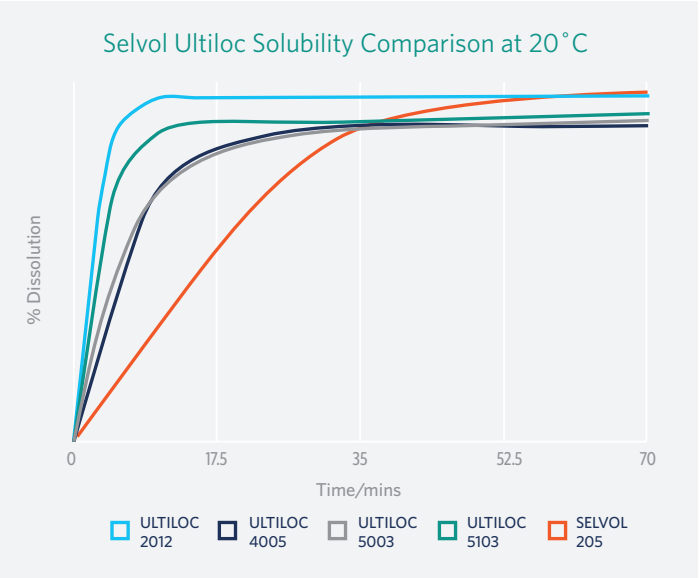
As part of our Specialty Products range, Selvol Ultiloc copolymers combine chemistries to demonstrate properties unlike those of standard Selvol polymers, allowing for uses within a number of new industries.

Selvol Ultiloc copolymers can be utilized in a wide range of applications areas, including building & construction products, emulsions, adhesives, coatings, textiles, paper, flexible packaging, inks, ceramics, personal care and specialty applications. Sekisui Specialty Chemicals’ R&D program is committed to expanding this specialty product range to incorporate further industries and applications.

Selvol Ultiloc Series Compared to Selvol 523

Grade	Film Tensile Strength (MPa)*	Film Elongation (%)*	Film Disintegration (sec/mil)#	Film Dissolution (sec/mil)#	Tg (°C)	Tm (°C)
Ultiloc 2012	28	86	3	9	79.52	164.86
Ultiloc 4005	39	71	10	36	81.07	191.48
Ultiloc 5003	27	73	7	157	90	205
Ultiloc 5103	23	84	7	20	82	-
Selvol 523	38	86	7	19	74.42	180.29

* = 23°C/50%RH # = 20°C/500ml De-ionized water.



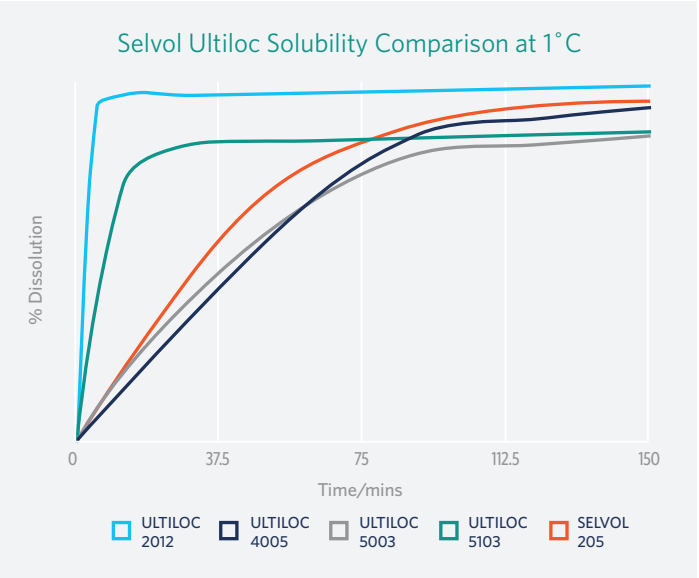
* Sifted resin, 250-400 micron particles.



The Copolymer Advantage

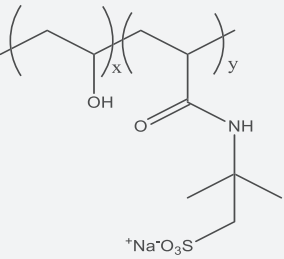
Sekisui Specialty Chemicals' novel Ultiloc copolymer technologies, while retaining some of the characteristics of conventional polyvinyl alcohols, also exhibit certain enhanced, improved, or even new features that expand potential applications, such as flexible packaging and extrusion.

Our highly skilled technical service group can help you with the best option for your target application.



Selvol Ultiloc 2012

Polyvinyl Alcohol/Vinyl CO-AMPS Copolymer
Chemical Structure

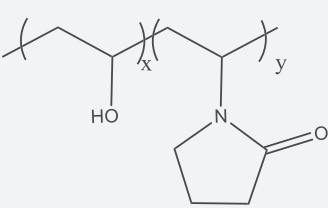


Properties vs Standard PVOH

- » Copolymer is stable over wide pH range
- » Lower temperature solubility and quicker dissolution process
- » Improved thermal stability
- » Lower melt temperature

Selvol Ultiloc 4005

Polyvinyl Alcohol/Vinyl Pyrrolidone Copolymer
Chemical Structure



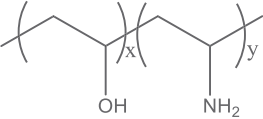
Properties vs Standard PVOH

- » Greater film flexibility
- » Increased moisture retention
- » Lower temperature solubility and quicker dissolution process

Selvol Ultiloc 5003

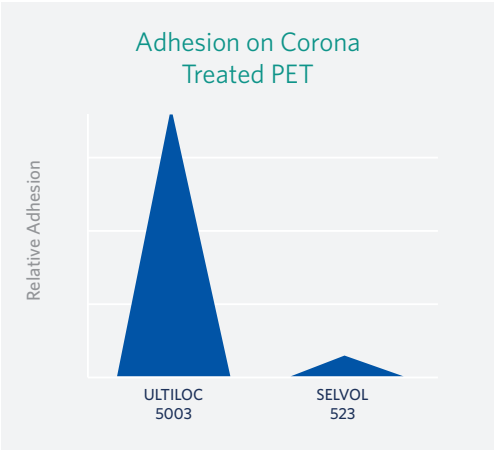
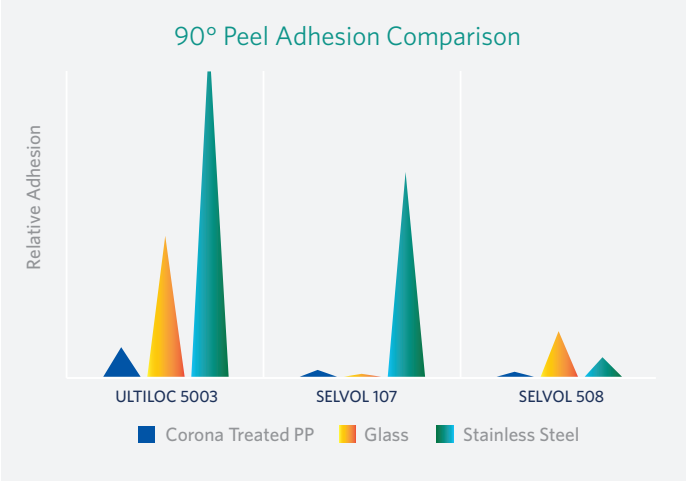
Selvol Ultiloc 5003 and Selvol Ultiloc 5103 are derivatives of the same base technology and are very similar in composition. Selvol Ultiloc 5003 has generated significant interest in recent years for exhibiting enhanced adhesion characteristics and higher reactivity/improved crosslinking properties.

Polyvinyl Alcohol/Vinyl Amine Copolymer
Selvol Ultiloc 5003 Chemical Structure



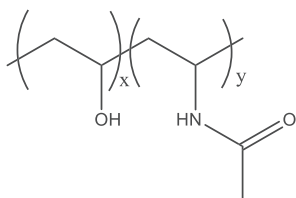
Properties vs Standard PVOH

- » Higher reactivity – leading to improved crosslinking or post reactions
- » Improved adhesion to wide variety of substrates, including difficult/low energy surfaces
- » Effective additive for improving adhesion characteristics in emulsion based adhesives
- » Lower temperature solubility and quicker dissolution process



Selvol Utiloc 5103

Polyvinyl Alcohol/Vinyl Formamide Copolymer Selvol
Utiloc 5103 Chemical Structure



Properties vs Standard PVOH

- » Slightly improved adhesion to substrates/difficult surfaces
- » Lower temperature solubility and quicker dissolution process



Customer Commitment

Selvol Utiloc copolymers have undergone thorough analysis to validate their characteristics and benefits. Sekisui Specialty Chemicals has a wide array of testing equipment and methodologies available to qualify application feasibility, assist in formulation, and suggest adjustments. Our knowledgeable specialists are ready and excited to support our customers in creating tomorrow's popular products.



Sekisui Specialty Chemicals

A new frontier, a new lifestyle.

Sekisui Specialty Chemicals is part of the Sekisui Chemical Group, a multibillion dollar global company that delivers a wide range of products and services to enrich people's lives. Sekisui has been striving to 'produce a better world with creative technologies' since its formation in 1947. The company is comprised of core businesses and technologies in housing, social infrastructure, and chemical solutions. Selvol Utiloc copolymers are the latest example of the depth and breadth of Sekisui Chemical Group's innovative contributions to these key business fields.

**COPOLYMERS THAT EXPAND ON THE
FUNCTIONALITY OF THE INDUSTRY TRUSTED
SELVOL POLYVINYL ALCOHOL PRODUCTS**

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