



Copolymers that Unlock Opportunities

Selvol Utiloc 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 Utiloc 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 Utiloc technologies.

Patents

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

*Patent owned by University of Pittsburg

Utiloc Series

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

1. 4% Aqueous Solution, 20°C 2. As % Na2O, Corrected Volatiles



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) ¹	Film Elongation (%) ¹	Film Disintegration (sec/mil) ²	Film Dissolution (sec/mil) ²	T _g (°C) ³	T _m (°C) ³
Ultiloc 2012	20-36	71-108	2-4	8-10	77-83	162-175
Ultiloc 4005	34-43	60-81	10-12	33-39	80-83	185-198
Ultiloc 5003	16-33	42-112	5-8	84-231	82-87	192-197
Ultiloc 5103	21-26	74-98	5-7	18-22	82-85	-
Selvol 523	33-42	69-103	6-7	17-21	72-74	148-180

1. Measured at 23°C and 50 relative humidity 2. Measured at 20°C in 500 ml de-ionized water. 1 mil = 25.4 micrometer 3. Values are obtained from the second DSC scan

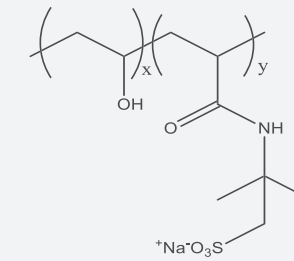
The Copolymer Advantage

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

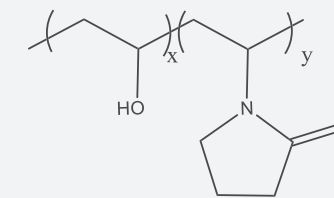


Properties vs Standard PVOH

- » 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



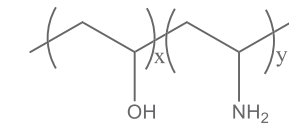
Properties vs Standard PVOH

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

Selvol Ultiloc 5003

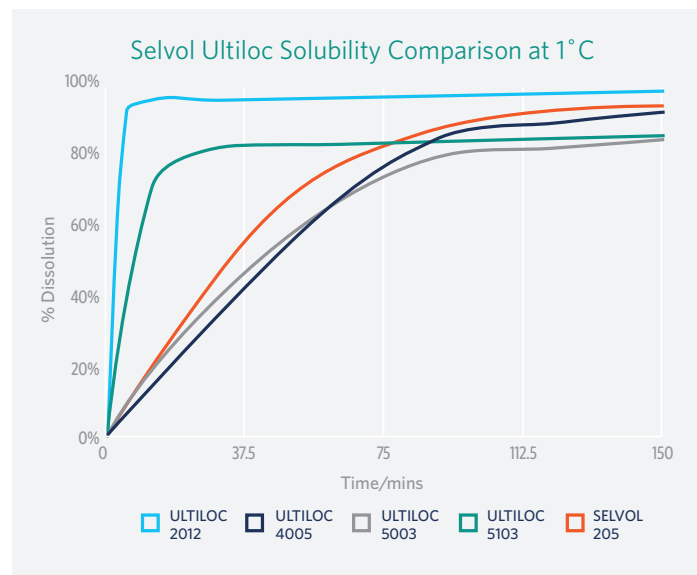
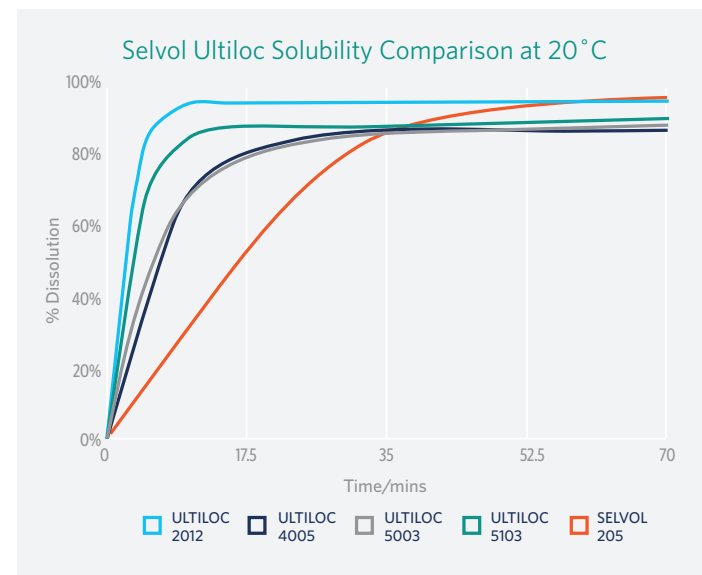
Selvol Ultiloc 5003 and Selvol Ultiloc 5103 are derivatives of the same base technology and are very similar in composition. Selvol Ultiloc 5003 has generated significant interest in recent years for exhibiting enhanced adhesion characteristics and higher reactivity/improved crosslinking properties.

Polyvinyl Alcohol/Vinyl Amine Copolymer
Selvol Ultiloc 5003 Chemical Structure

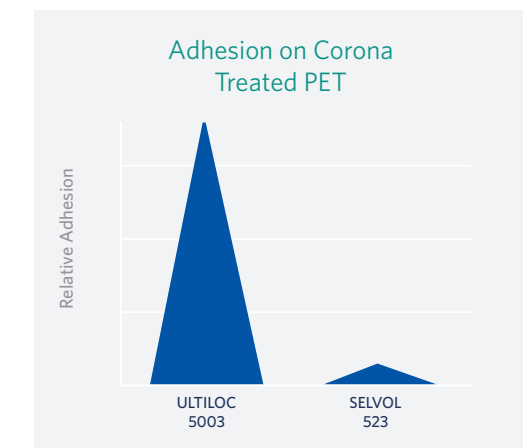
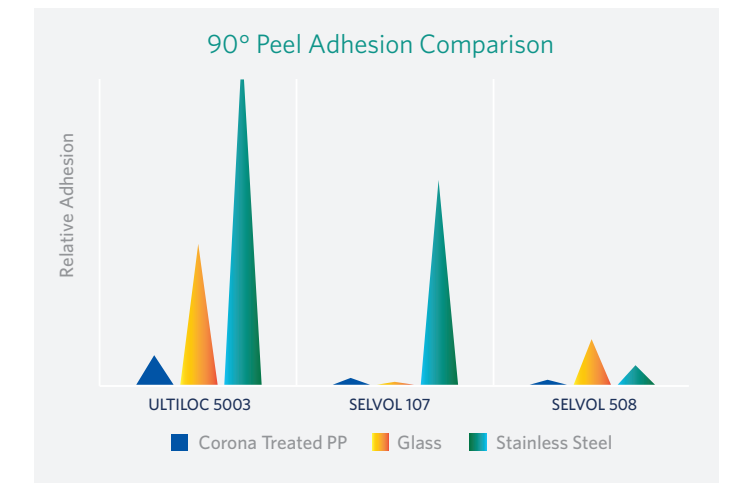


Properties vs Standard PVOH

- » 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

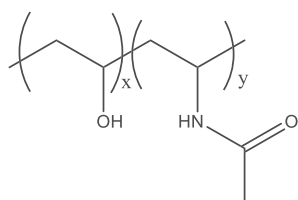


*Sifted resin, 250-400 micron particles in 8% solution.



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**

SEKISUI

North America:

Sekisui Specialty Chemicals America
1501 LBJ Freeway, Suite 530
Dallas, TX 75234-6034
Tel +1-972-277-2901
Fax +1-972-277-2907
www.sekisui-sc.com

Europe:

Sekisui Specialty Chemicals Europe S.L
Ctra. N-340 Km. 1157 Apdo. 1388
43080 Tarragona, Spain
Tel +34 977549899
Fax +34 977544982

Visit www.selvol.com for more information about our products.

To the best of our knowledge, the information contained herein is accurate. However, neither Sekisui nor any of its affiliates assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material and whether there is any infringement of patents is the sole responsibility of the user. All chemicals may present unknown health hazards and should be used with caution. Although certain hazards may be described in this publication, we cannot guarantee that these are the only hazards that exist. Users of any chemical should satisfy themselves by independent investigation of current scientific and medical knowledge that the material can be used safely. In addition, no certification or claim is made as to the status, under any law or regulation, including but not limited to the Toxic Substances Control Act, of either the chemicals discussed above or any subsequent polymerization or reaction products that result from a formulation containing them.