

Styrene Modified Synthetic Polyisoprene Latex for Skin Friendly Latex Products

9th IRGCE September 2018

Adeline Kung,
Bert Krutzer, Chia Sing Ling,
Nico Van Dijk, Wouter De Jong

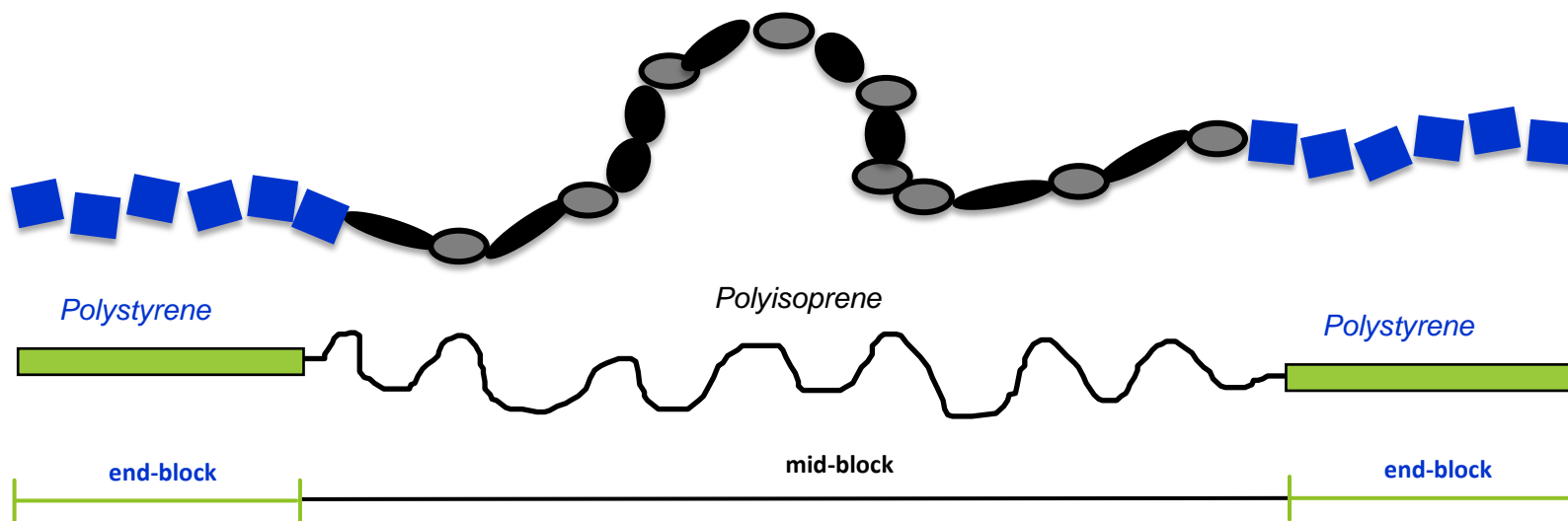
Polyisoprene-Styrene Modified Latex

- In the past decade there has been a push for greater product safety both by consumers and regulatory bodies. Besides, manufacturers are also looking for quality and consistency of raw materials used in production.
- Dipped goods manufacturers have successfully commercialized synthetic alternatives to Natural Rubber as means to mitigate Type I allergy and to reduce variability of the natural resource which is subject to geographical and seasonal quality variations.
- The market is now looking for next generation improvements - safer in manufacturing and end use with reduced risks associated to Type IV allergies and carcinogens like nitrosamines which are not related to the elastomeric raw material.
- This presentation introduces a new Synthetic polyisoprene based latex which combines Pure, Strong and Soft attributes of Kraton's Cariflex™ IR0401 Synthetic Polyisoprene latex with processing & film formation characteristics of thermoplastics.



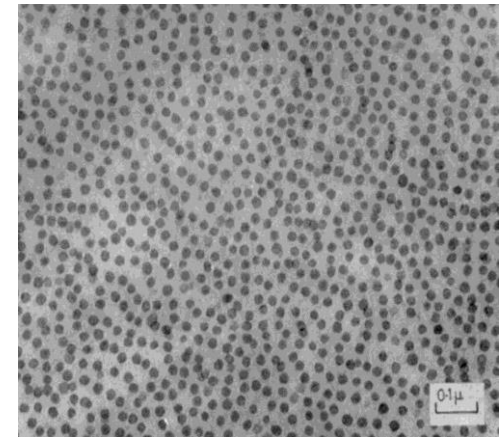
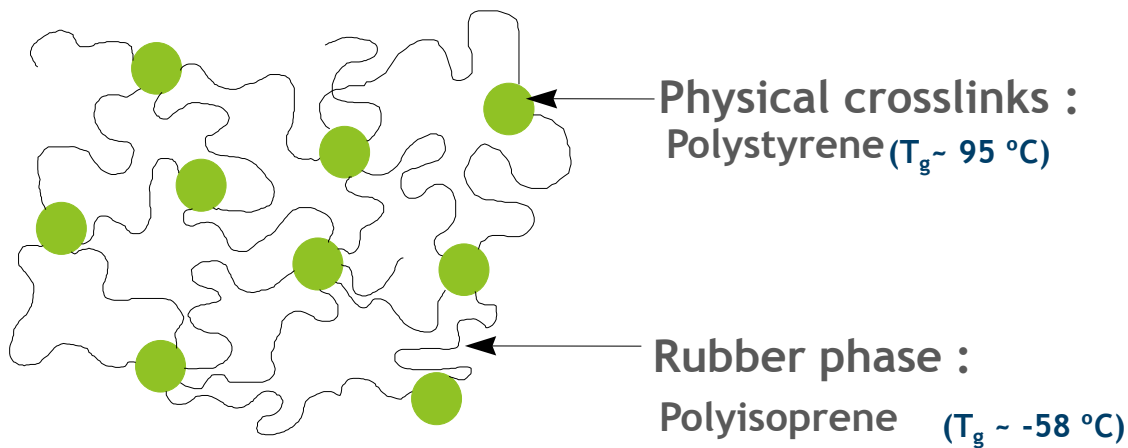
Introducing Cariflex™ IR2GL1 Latex

- Cariflex™ IR2GL1 Latex is a synthetic latex of polyisoprene-styrene modified rubber custom designed to provide a greater flexibility in the choice of compound formulas - it can be used as a thermoset or as a thermoplastic, and all hybrid solutions in between.
- It is a clean and pure thermoplastic elastomer free of natural rubber proteins offering strength, flexibility and softness features.
- It can potentially be used to enable production of latex goods with low or free of crosslinking chemicals, hence mitigating Type I and Type IV allergies as well as nitrosamines concerns.



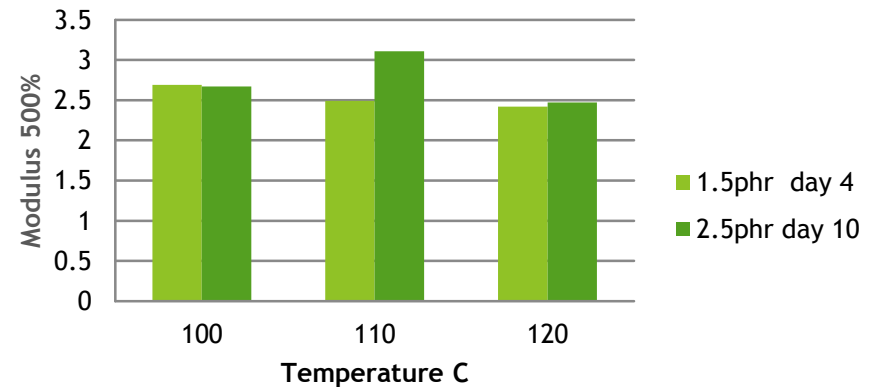
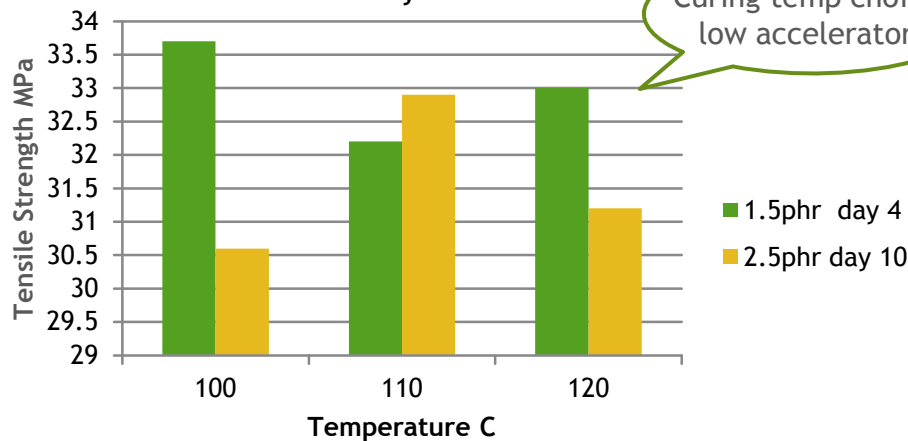
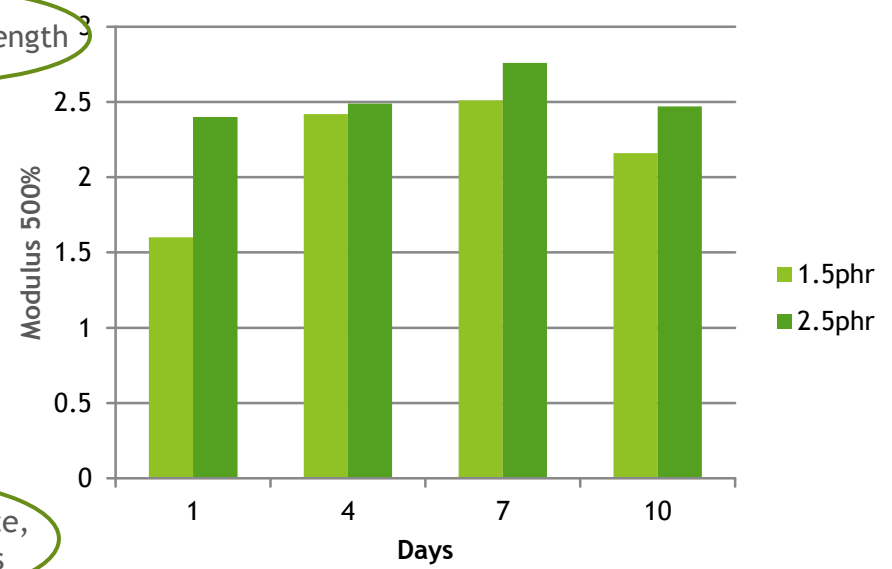
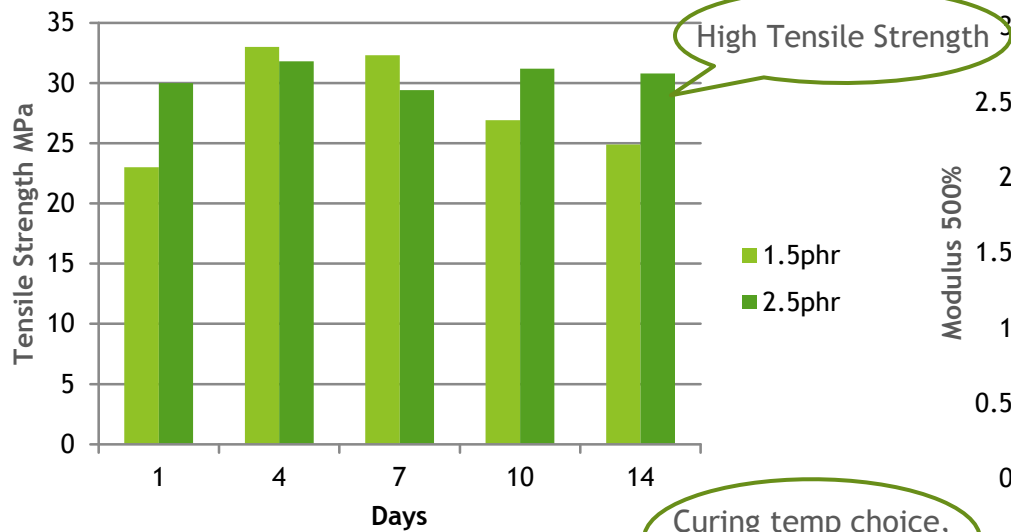
What is Cariflex™ IR2GL1 Latex

- Cariflex™ IR2GL1 is a latex thermoplastic elastomer
- It is a copolymer having a two-phase structure of both a hard segment and soft segment
- It behaves like an elastomer at ambient temperature
- It has inherent material strength (without chemical crosslinking) provided by polystyrene physical crosslinks



Cariflex™ IR2GL1 Latex

Cariflex™ IR2GL1 compounded with Bostex™ 909 masterbatch



Cariflex™ IR2GL1 Latex

Cariflex™ IR2GL1 without Chemical Crosslink

Chemical crosslinking is not required but

Tensile strength (MPa)	500% Modulus (MPa)	Elongation at Break (%)
19 - 24	1.5 - 2.0	1000 - 1100

- ‘curing’ step at 120°C for 20 mins is required in order to achieve tensile strength of >17MPa
- Antioxidant is required for ageing and sterilization protection

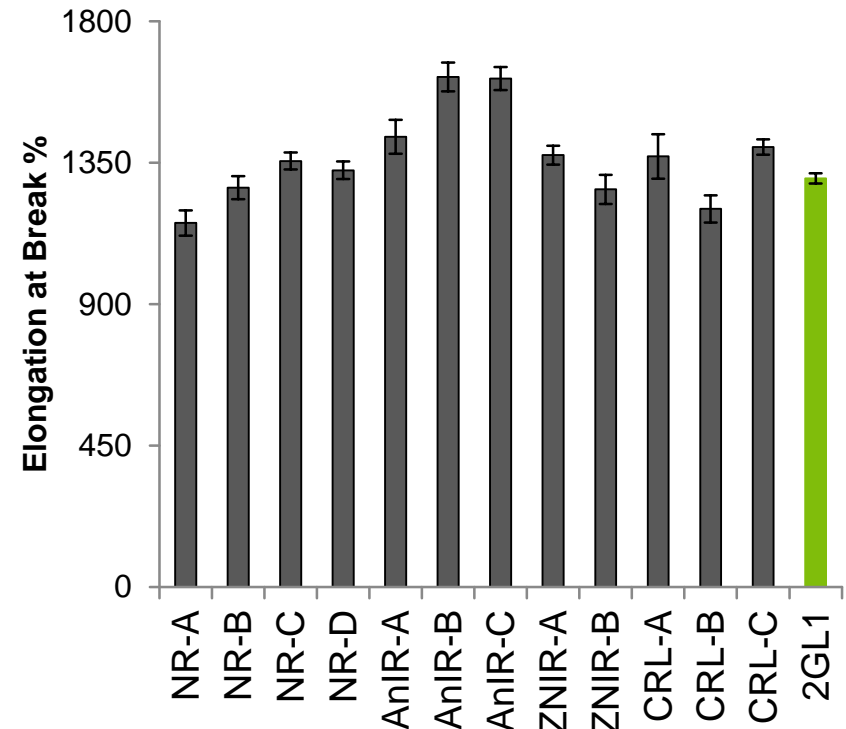
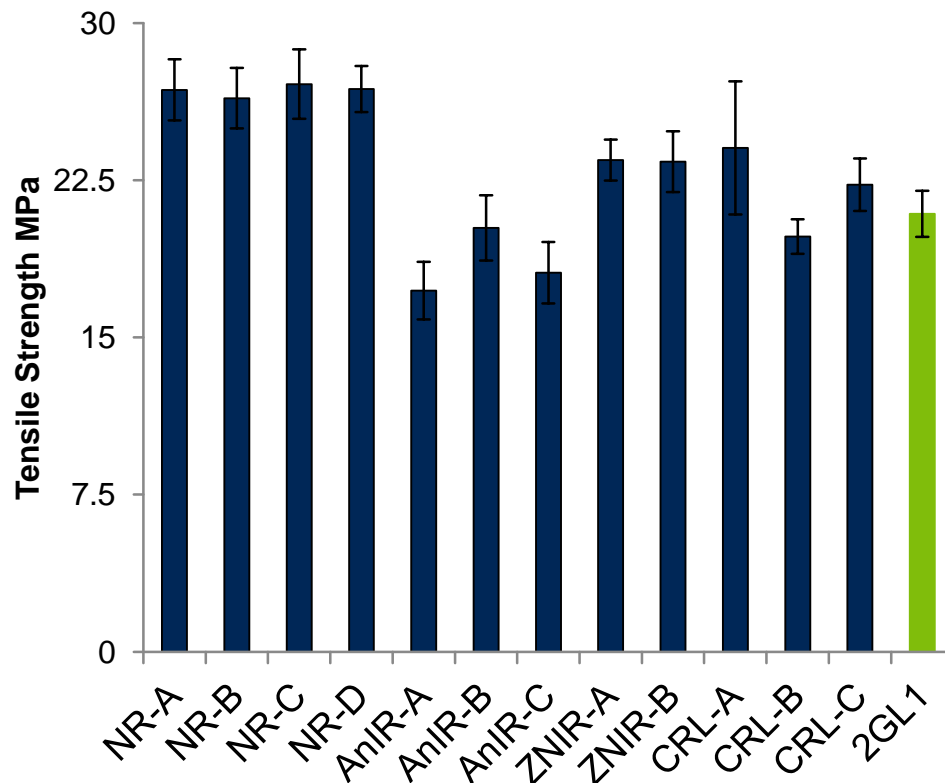
Cariflex™ IR2GL1 Latex Properties

Latex	Cariflex™ IR2GL1	Natural Rubber
Total Solids Content %	Min 63%	~61-62
pH	9.5-11.5	~10.0-11.5
Viscosity cps	Max 150cps	~80-150
Median Particle Size mm	1.8Max	~0.9



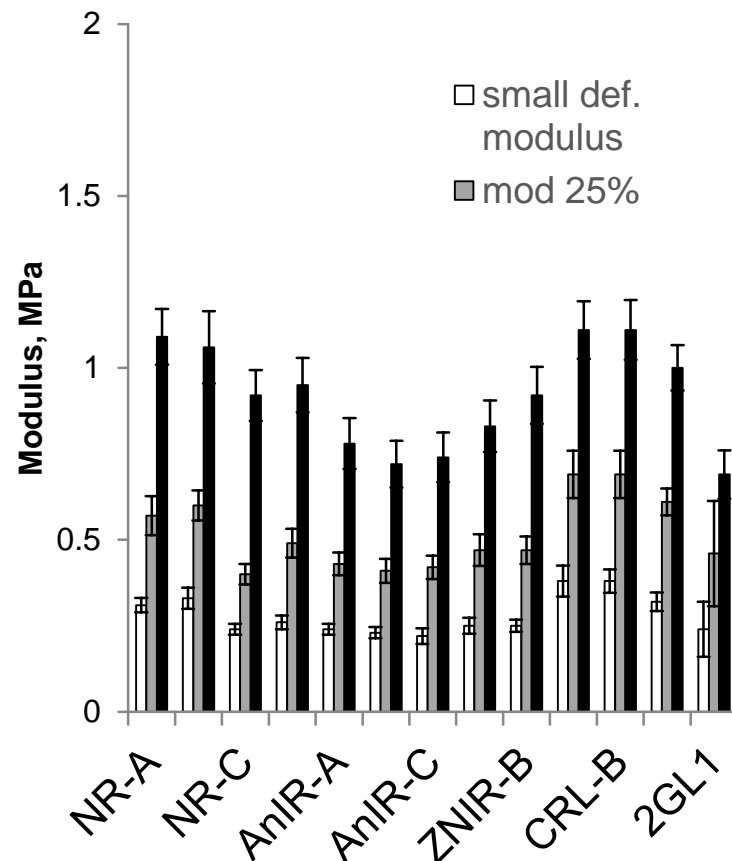
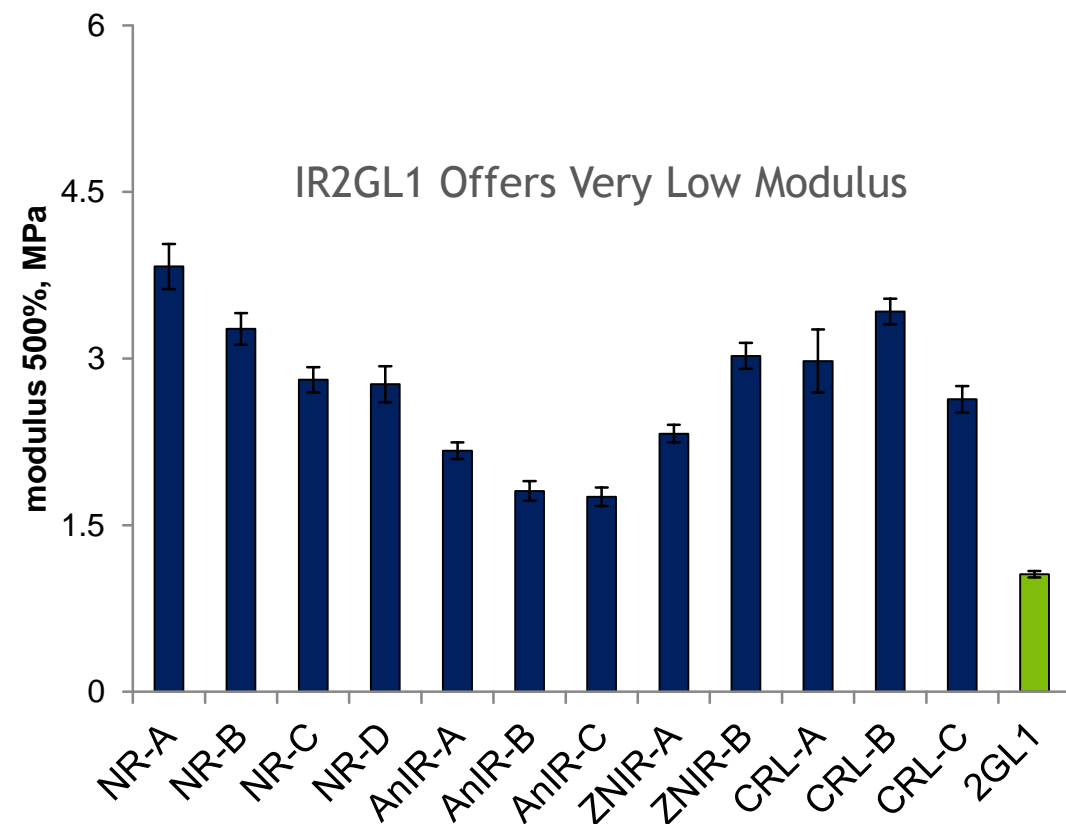
Cariflex™ IR2GL1 Latex

Tensile Strength and elongation at break of uncrosslinked dipped IR2GL1 compared against commercial surgical gloves - Natural Rubber (NR-*); Anionic PI (AnIR-*); Ziegler-Natta PI (ZnIR-*); Chloroprene (CRL-*); IR2GL1 (2GL1)



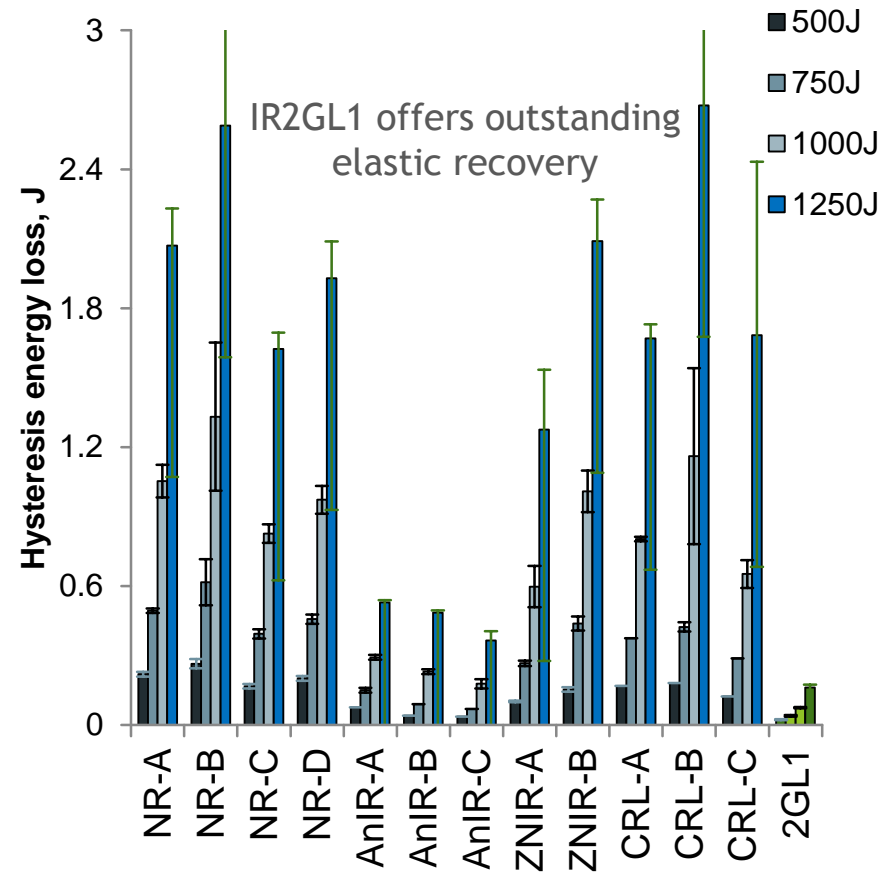
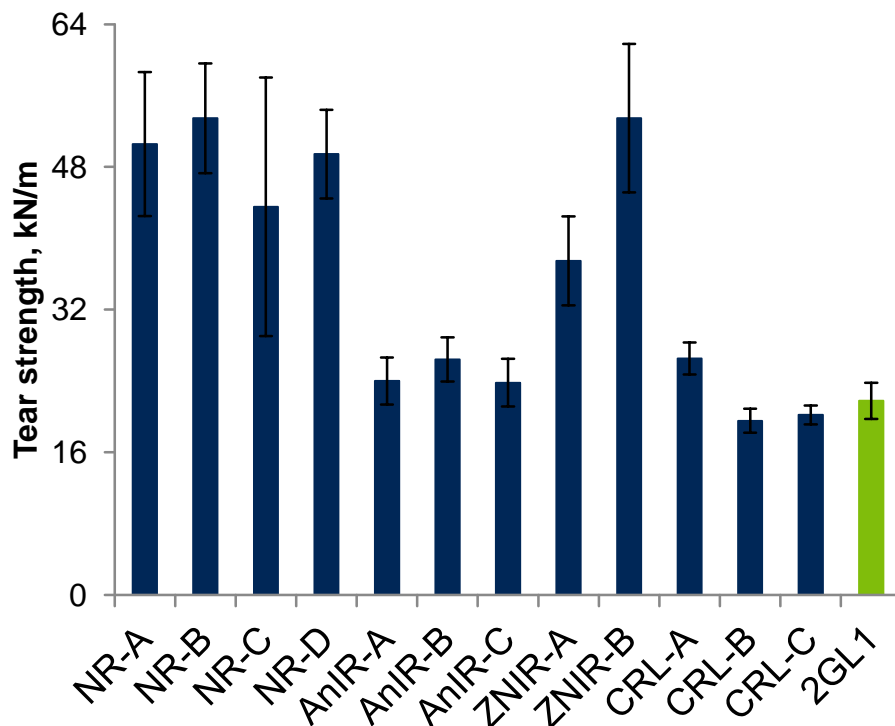
Cariflex™ IR2GL1 Latex

Modulus and small deformation of uncrosslinked dipped IR2GL1 compared against commercial surgical gloves - Natural Rubber (NR-*); Anionic PI (AnIR-*); Ziegler-Natta PI (ZnIR-*); Chloroprene (CRL-*); IR2GL1 (2GL1)

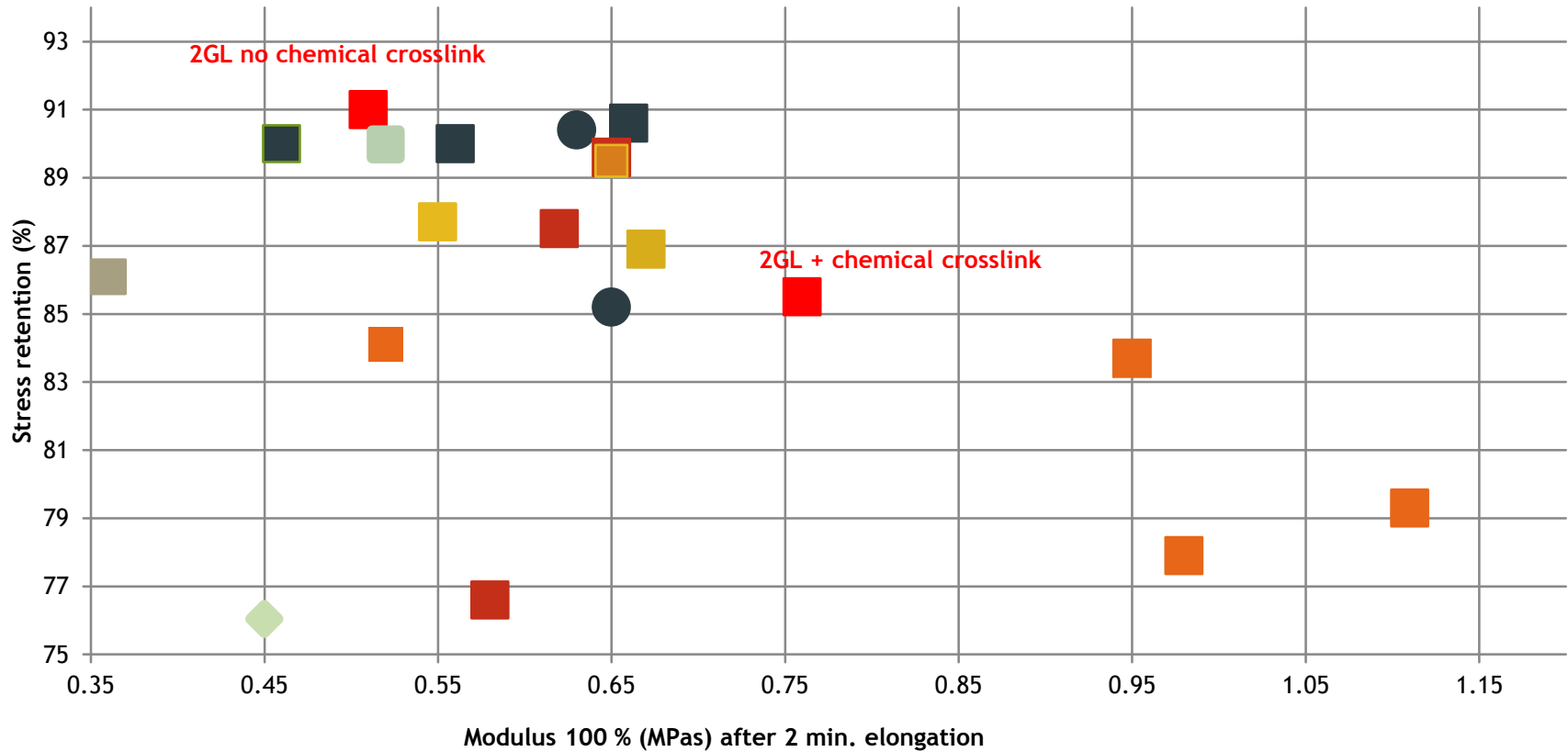


Cariflex™ IR2GL1 Latex

Tear strength and hysteresis loss of uncrosslinked dipped IR2GL1 compared against commercial surgical gloves - Natural Rubber (NR-*); Anionic PI (AnIR-*); Ziegler-Natta PI (ZnIR-*); Chloroprene (CRL-*); IR2GL1 (2GL1)

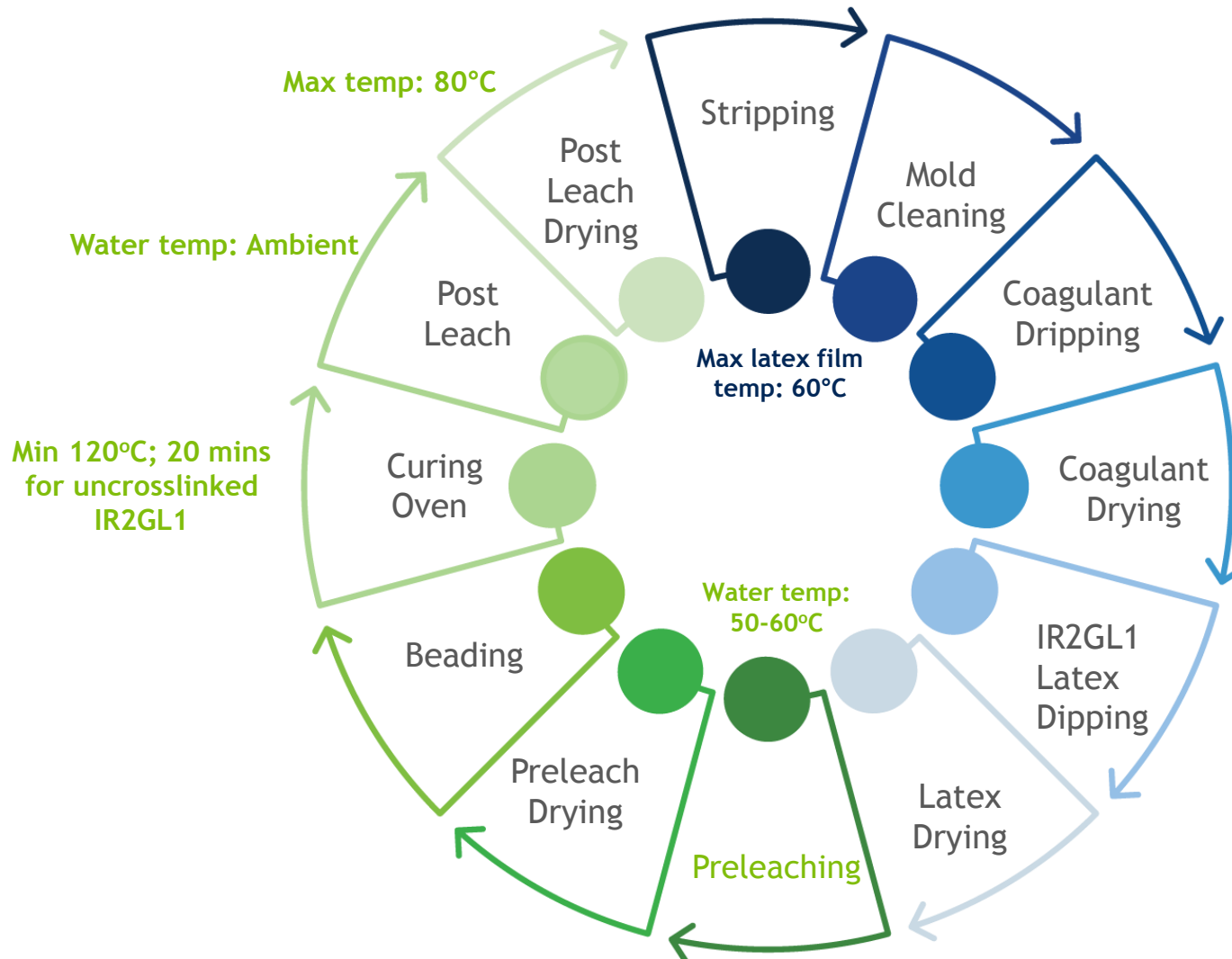


'Comfort in Use' Comparison



- CFX-A
- CFX-B
- CFX-C
- CFX-Synt 10%
- CFX-Synt 20%
- NRL-A
- NRL-B
- NRL-C
- ZN-A
- ZN-B
- ZN-C
- CRL-A
- CRL-B
- CRL-C
- 2GL
- 2GL xlink
- PI Blend
- Solv SEBS 1
- Solv SEBS 2
- Solv SEBS 3

Suggested Processing Steps



Suggested process is similar to NRL or Synthetic Polyisoprene latex coagulant dipping but with specific control parameters.

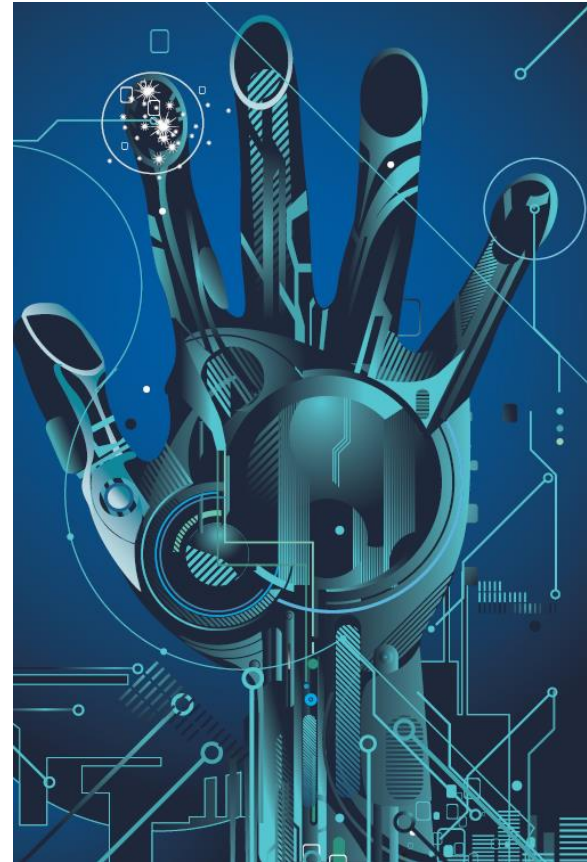
Conclusion

Cariflex™ IR2GL1 Latex

- A next generation latex suitable for dipped goods
- Type I allergy free
- Custom designed to provide
 - “Pure, Soft and Strong” features with options for
 - Type IV allergy reduction and
 - Nitrosamines reduction requirements.

Can be used:

- without curing chemicals
Or
- Yield good quality cross-linked films with low level of accelerators
Or
- Deliver high strength films (~30 MPa) based on a simple thiuram-based recipe



Legal Disclaimer

Kraton Corporation and all of its affiliates, including Kraton Chemical, believe the information set forth herein to be true and accurate, but any recommendations, presentations, statements or suggestions that may be made are without any warranty or guarantee whatsoever, and shall establish no legal duty on the part of any Kraton affiliated entity. The legal responsibilities of any Kraton affiliate with respect to the products described herein are limited to those set forth in Kraton's Conditions of Sale or any effective sales contract. NOTE TO USER: by ordering/receiving Kraton product you accept the Kraton Conditions of Sale applicable in the region. All other terms are rejected. Kraton does not warrant that the products described herein are suitable for any particular uses, including, without limitation, cosmetics and/or medical uses. Persons using the products must rely on their own independent technical and legal judgment, and must conduct their own studies, registrations, and other related activities, to establish the safety and efficacy of their end products incorporating any Kraton products for any application. Nothing set forth herein shall be construed as a recommendation to use any Kraton product in any specific application or in conflict with any existing patent rights. Kraton reserves the right to withdraw any product from commercial availability and to make any changes to any existing commercial or developmental product. Kraton expressly disclaims, on behalf of all Kraton affiliates, any and all liability for any damages or injuries arising out of any activities relating to the use of any information set forth in this publication, or the use of any Kraton products.

Kraton maintains a Cosmetics, Drugs and Medical Device Policy that restricts the use of Kraton's Products in certain end use applications without Kraton's prior written consent. Accordingly, Kraton does not guarantee that Kraton's products will be available for use in all potential end use applications. Kraton's Cosmetics, Drugs and Medical Device Policy is available on Kraton's website at www.kraton.com.

KRATON, the Kraton logo, and CariflexTM are either trademarks or registered trademarks of Kraton Corporation, or its subsidiaries or affiliates, in one or more, but not all countries.

©2018 Kraton Corporation