

# *In Vitro* Characterization of a Novel Reusable Silicone Hydrogel Contact Lens with Surface Modification of MPC Polymer

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## Background

Lehfilcon A is a new silicone hydrogel (SiHy) material with surface modification of a cross-linkable bioinspired 2-methacryloyloxyethyl phosphorylcholine (MPC) polymer to advance the properties and performance of reusable contact lenses. This study was conducted to characterize lehfilcon A in fully hydrated conditions for its unique surface structure and compare its *in vitro* properties to those of other traditional SiHy materials.

## Methods

Environmental scanning electron microscopy (ESEM), atomic force microscopy (AFM), and a combination of these two technologies were applied to image the detailed structures of MPC polymer surface layer on lehfilcon A lens. AFM nanoindentation and tribometer were utilized to compare the surface softness and lubricity of lehfilcon A, comfilcon A, senofilcon A, and senofilcon C contact lenses. All analyses were conducted in either 100% relative humidity or aqueous solutions to maintain lenses at hydrated state, mimicking on-eye conditions.

## Results

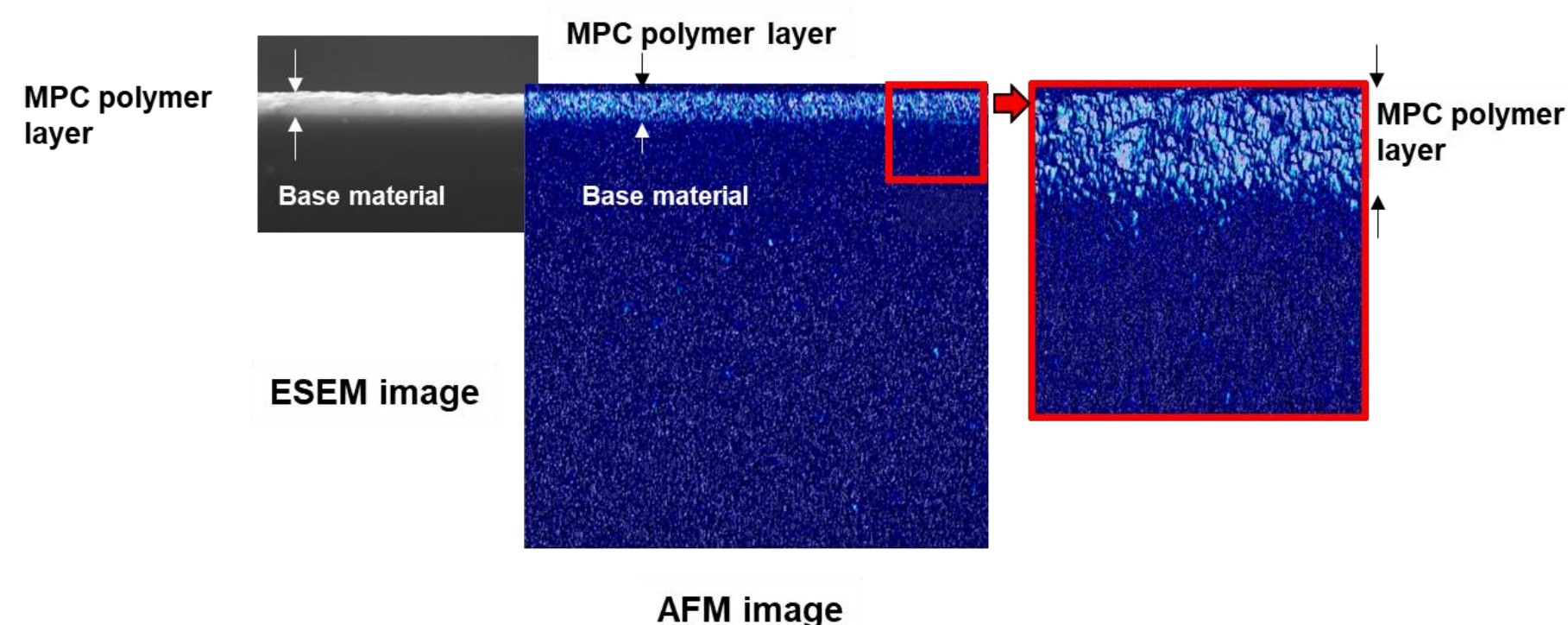


Figure 1. A distinctive layer of hydrated MPC polymer was clearly visible on the surface of the lehfilcon A lens cross-section under ESEM and was further confirmed by the AFM phase image.

## Results (Continued)

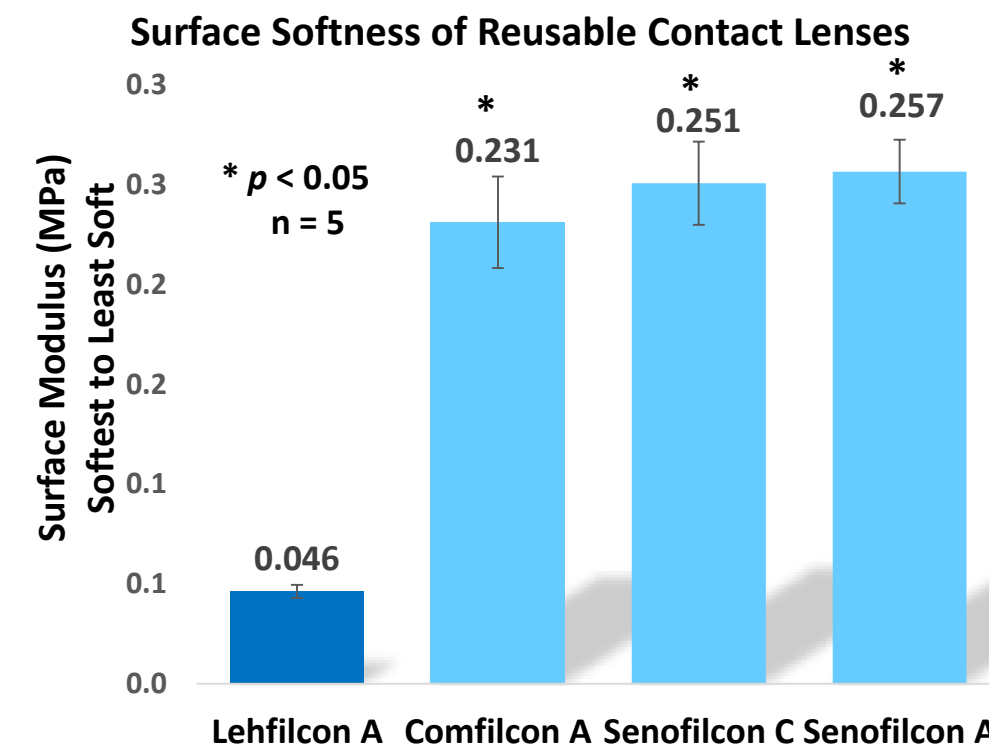


Figure 2. The AFM nanoindentation testing showed that surface of lehfilcon A lens was significantly softer than that of comfilcon A, senofilcon A, and senofilcon C lenses under the eyelid contact pressure ( $p < 0.05$  for all).

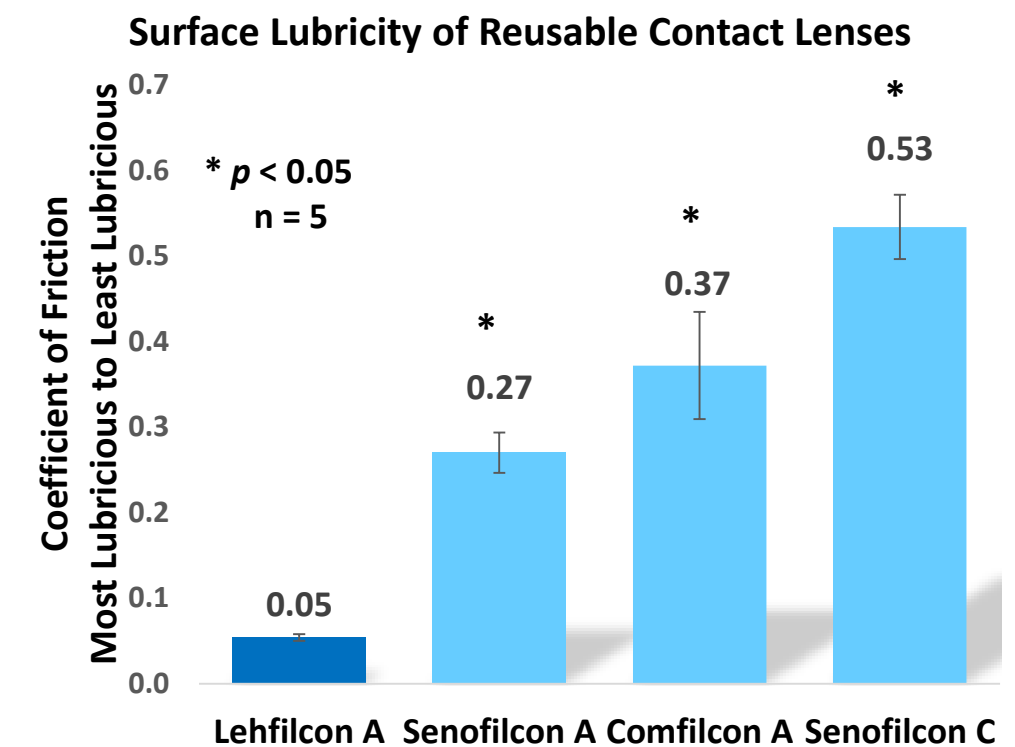


Figure 3. The coefficient of friction of the surface of lehfilcon A lens was also significantly lower than that of comfilcon A, senofilcon A, and senofilcon C lenses ( $p < 0.05$  for all).

## Conclusions

- A novel MPC surface-modified SiHy contact lens, lehfilcon A was characterized for its surface structure and *in vitro* properties.
- The results indicate that lehfilcon A lens has the exceptional surface characteristics of ultra-softness and superior lubricity compared to other reusable SiHy lenses.
- Lehfilcon A lens may provide surface mechanical properties similar to ocular surface, and is expected to achieve outstanding on-eye performance.