

# SmartGel<sup>®</sup>

*Optical Coupling Technology*



# SmartGel<sup>®</sup>

SmartGel<sup>®</sup> is a growing family of silicone-based optical couplants that are used to improve lumen output, ensure signal reliability, and increase the dependability and performance of light-based technology.

We call it SmartGel because it “knows” how you want your product to perform.

We match the refractive index of SmartGel to your mated optical materials to minimize reflection and birefringence. Because different products require different levels of strain relief or dimensional stability, SmartGel’s hardness can range from a gelatin-like to a hard-rubber consistency. SmartGel’s cure time can be set from minutes to hours to days, depending on your production requirements. It can also be designed to “snap cure.” SmartGel resists water, ionizing radiation, reactive chemicals, humidity, frequent temperature cycling, and high temperature spikes from soldering. Your product sets our standards.

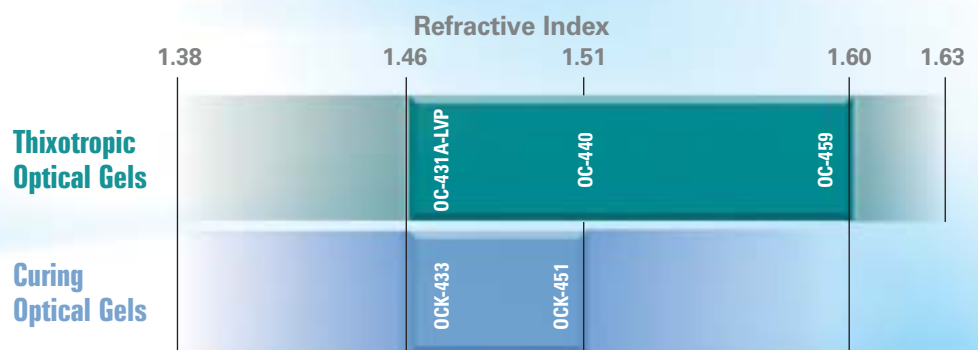
SmartGel manufacturing is a tightly controlled, proprietary process. SmartGel raw materials undergo rigorous, pre-production conditioning to improve the optical clarity and stability of the base polymers. Formulated gels are ultrafiltered to ensure the highest standards of cleanliness. All containers are meticulously sterilized. Then, each SmartGel is packaged in a Class 10,000 environment.

With Nye, you get a partner who is committed to your success. And with SmartGel, you get an index-matching gel that “knows” how you want your product to perform.

## Nye’s Standard SmartGels

*Ask about our wide range of custom formulations.*

*Optically clear in the visible range from 400 to 750nm, SmartGel minimizes reflection that occurs when light must pass through air or mated optical materials with different refractive indices.*



# *Innovations* in Light-Transmitting Gels

SmartGel® has been on the forefront of optical design and innovation for more than 20 years. From optical fiber networks to high-brightness LEDs, SmartGel technology has enabled our customers to improve the performance, reliability and operating life of photonic products.

In the 1980s, 3M — and subsequently Lucent Technologies — chose SmartGel to perfect “mechanical splices,” a breakthrough alternative to a costly and complex method of fusing glass fiber. SmartGel was used to mate fiber strands with minimal reflection, making fiber connections in the field quick and easy.

In the 1990s, Bell Labs wrote the standard for optical fiber connectors and splices (Bellcore GR-2919-CORE). By handily meeting that strict requirement, SmartGel accelerated a new generation of high-speed, light-based communication.

SmartGel then entered the world of high-brightness LEDs. Nye worked closely with LED packaging engineers to develop a custom formulated SmartGel that helped HB-LED manufacturers maximize lumen output and extend lamp life. Nye continues to work with leaders in the HB-LED industry on new products for both display and illumination.

Today Nye is collaborating with a broad base of innovators in optical technology. We’re introducing SmartGel to automotive lighting engineers, flat panel display manufacturers, Fiber-To-The-Home network developers, and lighting design companies. Based on market needs, our technology roadmap includes new gel chemistries, higher refractive indices, lens-like hardness, broader temperature compatibility, improved optical clarity, and enhanced lumen output — all to add value and performance to our customers’ products.



# Adding Value and Performance to Photonic Technology

## SmartGel: Core of High-Brightness LEDs

LEDs are changing the very nature of lighting. LED traffic and emergency signals cut through darkness, fog and solar glare. Day-bright LED spectaculars light up Times Square at a fraction of former energy costs. Buildings glow with changing ambient hues. Streetlights illuminate without connections to the grid. Flat panel displays feature bright, LED backlights. Soon, LEDs may even replace Edison's light bulb. SmartGel encapsulants are playing a key role in this lighting evolution.

Specially engineered SmartGel formulations are core components in market-leading HB-LEDs. As diode encapsulants, SmartGels enhance the reliability, longevity and lumen output. They resist yellowing and cracking, common with epoxies. They are functional over a broad temperature range. And their rugged, viscoelastic consistency protects the diode and its delicate wire bonds. SmartGel is also used as a phosphor medium to create super bright, white LEDs.



## SmartGel to the Home

The promise of Fiber to the Home (FTTH) is to pipe voice, data, and video through one powerful broadband package. SmartGel is poised to help deliver on that promise. Embraced in the telecom industry as a connecting medium, SmartGel reduces potential signal loss in mechanical connectors and splices. In bringing fiber to the home, SmartGel can also be used as a connecting medium, eliminating the need for expensive, technically challenging fusion equipment. SmartGel can be matched to the refractive index of many engineered glasses and plastics. A proven, economical technology, SmartGel-based connectors can play an important role in pushing the FTTH industry forward.

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## **Flat Panels and SmartGel**

Display screens on cell phones, PDAs, and other digital devices need to stand up to the light of day. Enhanced screen brightness increases picture clarity, image quality and consumer satisfaction. Index-matched SmartGels enable more light to pass through the display to the eye of the consumer. The result is a brighter screen, with no additional impact on battery life. In fact, LCD manufacturers have already demonstrated that SmartGel can deliver a 17% increase in screen brightness. SmartGel can be a competitive advantage in a market that demands bright, cost effective, power efficient, flat panel displays.

## **SmartGel on the Road**

Automotive lighting is fast moving to sophisticated solid-state illumination. HB-LEDs are already used in taillights, running lights, instrument panels, and interior lighting. And design engineers are now using LEDs as a tool to differentiate their brands. SmartGel technology adds a rugged, wide-temperature durability to these applications. It also resists yellowing, cracking and delaminating to ensure long lighting life.

In many new vehicles copper wiring is giving way to fiber networks. Impact sensors, GPS, onboard telephones, and entertainment systems are already switching to fiber to enhance driver safety and satisfaction. SmartGel technology ensures the integrity of optical connectors in these fiber networks. Plus, it already meets automotive standards for broad temperature tolerance. Nye is recognized for innovative electro-mechanical design solutions in the automotive world. With SmartGel that same expertise extends to light-based technology.





Nye Lubricants, Inc.  
12 Howland Road  
Fairhaven, MA 02719 USA  
Ph: 1.508.996.6721  
Fx: 1.508.997.5285  
E-Mail: [techhelp@nyeoptical.com](mailto:techhelp@nyeoptical.com)

[NyeOptical.com](http://NyeOptical.com)



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