

# Akreos IOL Material in a Class of its Own

**The new-generation hydrophilic acrylic copolymer offers excellent biocompatibility and quality of vision.**

Among the more than 3 million eyes that have been implanted with Akreos IOLs worldwide are those of the 89-year-old father of Dana J. Weinkle, MD. "He loves them," Dr. Weinkle says. "He can watch television, use the computer and drive comfortably without eyeglasses. He only wears eyeglasses for reading."

The overwhelmingly positive reaction was no surprise to Dr. Weinkle, who specializes in cataract and refractive lens implant surgery in Bradenton and Sarasota, Fla., and uses the Akreos AO lens in nearly 100% of his monofocal IOL cases. "Patients have very rapid recovery, minimum inflammation and excellent acuity," he says.

The Akreos AO is one of two recent U.S. market additions to the Akreos family of lenses (Figures 1 and 2). The other is the Akreos MICS lens, which can be implanted through a 1.8-mm incision. These IOLs both have an aspheric, aberration-free optic. Because they add zero spherical aberration to the visual system, leaving the eye with its natural amount of corneal positive spherical aberration, they provide good depth of field and better contrast sensitivity than standard spherical monofocal lenses.<sup>1,2</sup> They have uniform power from center to edge, which means their performance is unaffected by pupil size or lens decentration.<sup>3</sup>

All of the IOLs in the Akreos family, including the AO (AO60) and MICS (MI60) models, are made from the same innovative hydrophilic acrylic material. Surgeons who use the lenses say this material provides multiple benefits for them and their patients.

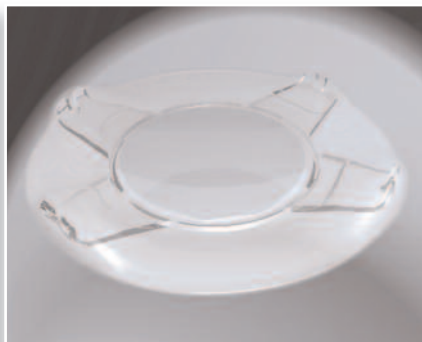
## Excellent Biocompatibility

The Akreos material was developed in 1997 and is now used exclusively by Bausch + Lomb. Prior to the Akreos lenses, the first hydrophilic acrylic materials used in the manufacture of IOLs, which were hydroxyethylmethacrylate (HEMA)-based, were too flexible to provide good lens stability in the eye. So to create the Akreos material, polymethylmethacrylate (PMMA), a more rigid material, was added to reinforce the mechanical properties of the polymer. Both polymers have been used extensively in ophthalmology and have demonstrated excellent biocompatibility. PMMA has been used in IOLs since they were first introduced, and HEMA is used both extraocularly in contact lenses and intraocularly for scleral implants and IOLs.

The Akreos material has been shown to induce relatively low levels of early postoperative cell overgrowth.<sup>4</sup> "It's highly biocompatible," Dr. Weinkle said. "We don't see pigment dust or lens epithelial cell overgrowth onto the optic."

Also of note, the Akreos material hasn't been associated with primary calcification, a problem that occurred in previously developed hydrophilic acrylic IOLs. Research led by David J. Apple, MD, was instrumental in having those earlier lenses redesigned or removed from the market. Dr. Apple, currently professor of ophthalmology and pathology and director of the David J. Apple Laboratories for Ophthalmic Devices Research on Sullivan's Island, S.C., said it's important to understand the difference between primary and secondary IOL calcification.

Primary calcification is an inherent problem with the lens itself. This allows a calcium compound from the aqueous to permeate into the body of the lens. "Primary calcification has not been seen in Akreos lenses," Dr. Apple says. "Secondary calcification is by definition not IOL-related," he continues. "It can occur with other IOL materials and can be associated with surgical trauma, such as a ruptured capsule, or pre-existing ocular disease that stirs up inflammatory cells in the anterior chamber. Unlike with primary calcification, in secondary calcification



**Figures 1-2.** The Akreos AO and Akreos MICS IOLs (Bausch + Lomb) are made from a proprietary HEMA/PMMA copolymer.

cification, cells are deposited only on the lens surface. I'm aware of only a handful of cases in which an Akreos IOL was affected by secondary calcification."

Dr. Apple adds that hydrophilic acrylic IOLs<sup>6</sup> (as well as heparin surface modified silicone IOLs) are the least prone to silicone oil adhesion, which is important for patients who potentially will require treatment for vitreoretinal disease.

## Quality of Vision

Optical clarity is another attribute of the Akreos IOL material that's apparent to surgeons, according to Dr. Weinkle. "The lenses have an optically clear, pristine surface with no inclusions," he says. "In contrast, some hydrophobic acrylic lens materials have been found to contain small voids or vacuoles. These vacuoles can take up water, creating refractive heterogeneities, referred to as glistenings, that can increase over time and negatively impact visual acuity. No vacuoles or glistenings have been seen in the hydrophilic acrylic Akreos lenses."

In addition, the Akreos material has a refractive index (RI) of 1.46. This is a moderate RI, lower than that of some hydrophobic acrylic materials, which have an RI of 1.55. The moderate RI limits internal and external light reflection, reducing the risk of dysphotopsias such as glare or temporal darkness<sup>7,8</sup> that can be extremely unpleasant for some patients. Akreos IOLs are precision lathe-cut, not cast-molded, and are designed to reduce dysphotopsias.

With 26% water content, the Akreos material is compressible and foldable, yet extremely resistant to mechanical stress. It regains its shape even after strong compressions without any marks on the surface. These properties made it ideal for the Akreos MICS lens.

## Material Plus Design Equals Advantages

Discussing his experience with the Akreos AO lens, Dr. Weinkle credited the Akreos material as contributing to ease of insertion (Figure 3). "Because the material is pliable and compressible, the lens requires a smaller incision size and unfolds in a smooth and controlled manner. It opens more rapidly than a hydrophobic acrylic lens, but it doesn't spring open," he says.

"The material is also strong and resilient. Unlike some other materials that can be marred by handling with forceps during placement in the cartridge, it resists tears, surface blemishes and scratches."

Dr. Weinkle says he was able to achieve very good results beginning with his first Akreos AO cases. Among his first 29 eyes, 100% had greater than or equal to 20/40 BCVA; 79% had 20/20 or better BCVA; 83% had greater than or equal to 20/40 UCVA; and 76% were within a half diopter of the target refraction.

Akreos lenses have attractive design features as well, Dr. Weinkle says. Direct contact with the posterior capsule, square

optic and haptic edges, and a 360° posterior barrier edge help to minimize the rate of posterior capsule opacification.

"The lenses are also YAG friendly," he adds. "They don't pit or fracture like some hydrophobic acrylics."

In addition, the four-haptic design maximizes contact between the lens and the capsular bag to optimize stability. The combination of these design features and the unique hydrophilic acrylic material gives Akreos lenses both short- and long-term advantages over other IOLs, Dr. Weinkle says.

"My patients experience fewer dysphotopsias, excellent clarity and contrast, and better depth of focus than with other lenses. Furthermore, I can count on stable refractions over time and improved biocompatibility for patients with current or potential vitreoretinal issues."



**Figures 3.** The mechanical properties of the Akreos IOL material allow it to unfold smoothly inside the eye.

Joel Pynson, MD, director of design engineering at Bausch + Lomb, Toulouse, France, contributed information for this article.

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