Understanding Anti-Reflection And Increasing Percentages

(Optical Seminars Course # HS-09)

by

Anthony Record, LDO
Optical Seminars, Inc.
PO Box 5445
Spring Hill, FL 34611-5445
homestudy@opticalseminars.com

Course Objectives

Upon completing this one-hour home-study course, the optician should:

- **Have a better understanding of the history and development of AR.**
- **Realize the reasons why more people don't get AR on their glasses.**
- **Make changes in the dispensing process to increase AR percentages.**
- **Possess new, vital information to better educate patients about AR.**
- **Incorporate current best practices to dispense more AR jobs.**
- **Achieve a minimum score of 70% on the final assessment.**

Anti-Reflective Lenses – An Optician's Pre-Test

To begin this module, participate in this 10-question pre-test to assess your current comfort level with information regarding AR lenses—and what it takes to be most effective in persuading your patients to purchase them.

Note: Your score on this pre-test does not affect whether you pass or fail the final test. However, some information in the answer explanations may appear later, so do NOT skip this section.

Circle the best answer.

1. Which of the following may damage AR coatings (and, in severe cases, even the lens substrate or frame)?

a. Warm water and mild hand soap

b. Exposure to UV rays

c. Heat and pressure

d. All over-the-counter lens cleaners

2. Which types of materials are commonly used in AR "stacks" (thin film layers)?

a. Metal oxides (multiple types)

b. Organic dyes dissolved in the lens

c. Polarizing crystals embedded in the lens

d. Silicone hydrogel polymers

3. Each surface of an uncoated CR-39 lens reflects about what percent of light?

a. 2%

b. 4%

c. 6%

d. 8%

4. When a modern AR treatment is applied properly, surface reflections can be reduced to approximately:

a. Less than 1% per surface

b. About 3% per surface

c. About 5% per surface

d. More than 10% per surface

5. The thin-film materials used in AR stacks tend to be hard and brittle (glass-like) compared with the lens substrate.

a. True

b. False

6. The phenomenon in which reflected light waves cancel each other (reducing reflections) is called:

a. Creative destruction

b. Destructive analogy

c. Reflection wave theory

d. Destructive interference

7. Which type of patient may notice spectacle reflections “more” when switching from contacts to glasses?

a. Hyperopic patients

b. Myopic patients

c. Astigmatic patients

d. Contact lens patients

8. Which of the following is most true in everyday dispensing?

a. Most patients request AR before the optician mentions it

b. Many patients say they like AR, but a large portion still declines at purchase

c. AR is only useful on high-index lenses

d. AR is mostly about cosmetics and provides no functional benefit

9. In normal daily tasks (driving, computer use, handheld devices), AR-coated lenses are generally perceived by many wearers as offering:

a. No meaningful difference

b. Reduced glare and improved comfort

c. Worse clarity due to "layers"

d. Improved color vision accuracy in all lighting

10. Today's AR lenses aren't really coatings at all—they are part of the lens substrate.

a. True

b. False

Pre-Test Answers (with brief commentary)

1. C – Heat and pressure. Heat is a classic enemy of coatings. Teach patients to avoid leaving AR-coated eyewear on dashboards, on top of dryers, or near other heat sources.

2. A – Metal oxides (multiple types). Modern AR stacks commonly use combinations of thin-film materials (often metal oxides) applied in carefully controlled thicknesses.

3. B – 4%. A CR-39 lens transmits about 92% of incident light, meaning roughly 8% is reflected by the two surfaces combined (near-normal incidence).

4. A – Less than 1% per surface. AR coatings can reduce surface reflections to below ~1% of incident light. Consider the following comparison chart:

Material	Index of Refraction	No A.R.	With A.R.
CR-39	1.498	92.06 %	99.10 %
Crown Glass	1.52	91.40 %	99.23 %
Polycarbonate	1.58	89.41 %	99.00 %
High Index	1.60	89.02 %	99.00 %
Higher Index	1.67	87.06 %	98.23 %

5. A – True. Thin-film layers are hard/brittle compared with the substrate, which is why proper cleaning and reasonable care matters.

6. D – Destructive interference. This is the "physics engine" behind thin-film AR.

7. D – Contact lens patients. Many contact lens wearers notice spectacle reflections more because contacts don't create the same air–lens interfaces as spectacle lenses.

8. B – Many like AR, but many still decline it. In real life, the gap between "interest" and "purchase" is often about presentation, confidence, value framing, and process.

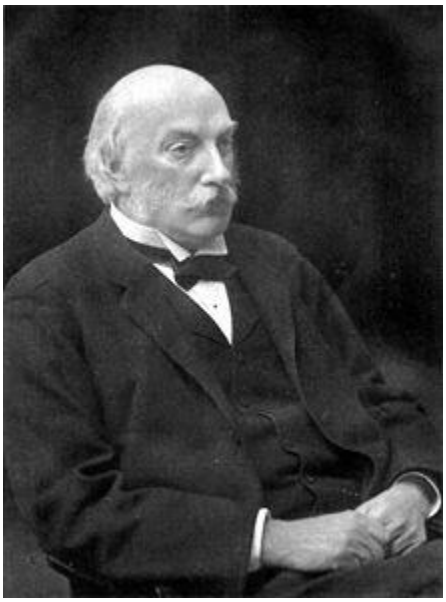
9. B – Reduced glare and improved comfort. Wearers commonly report better clarity/comfort for daily activities (including driving and device use), even when objective testing results vary by method.

10. B – False. AR is a surface-applied thin-film system. (Important note: UV absorbers, photochromic dyes, and some filtering technologies may be incorporated into lens materials—but AR performance requires surface coatings at the air–lens interface.)

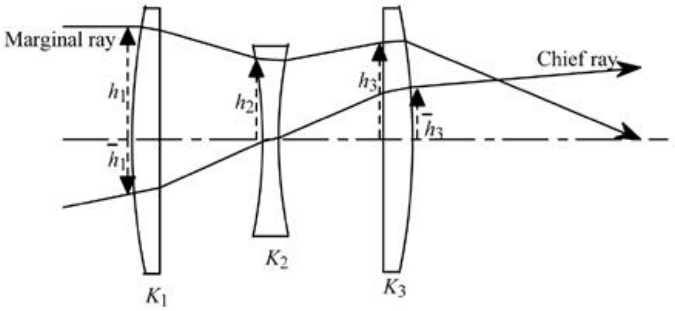
How did you do? Count the number you got correct and multiply that by 10. If we were back in school… that would be your grade.

The History of Anti-Reflective Lenses

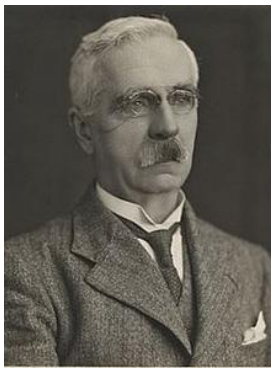
I am always surprised at how things that we take for granted today were first thought of so long ago. For example, there remain accounts of the Vikings in the eighth century complaining about "annoying sea glare." This led them to experiment with different rocks and minerals to eliminate it. This could easily be seen as a precursor to polarized lenses. About 1,000 years later, in 1886, John William Strutt, known as Baron Lord Rayleigh, discovered the earliest form of anti-reflective coatings. Eighteen years later, in 1904, along with William Ramsay, he earned a Nobel Prize for discovering argon. He is perhaps best known for discovering what is now known as the Rayleigh Effect – an explanation as to why the sky is blue. The simplest form of anti-reflective coating was discovered by Lord Rayleigh in 1886. According to a Wiki entry on Lord Rayleigh, "The optical glass available at the time tended to develop a tarnish on its surface with age, due to chemical reactions with the environment. Rayleigh tested some old, slightly tarnished pieces of glass, and found to his surprise that they transmitted *more* light than new, clean pieces. The tarnish replaces the air-glass interface with two interfaces: an air-tarnish interface and a tarnish-glass interface. Because the tarnish has a refractive index between those of glass and air, each of these interfaces exhibits less reflection than the air-glass interface did. In fact, the total of the two reflections is less than that of the 'naked' air-glass interface, since for near-normal incidence the reflectivity is proportional to the square of the difference in refractive index."



Lord Rayleigh



In the early part of the 20th century, a British optical inventor and designer named Dennis Taylor was working for Thomas Cooke and Sons in York, England. Cooke was known for producing the finest optical instruments of the time, especially telescopes. Taylor was granted more than 50 patents for his inventions and designs and is probably best remembered for inventing the Cooke Triplet. The Cooke Triplet (illustrated in the drawing next to the photograph of Lord Rayleigh) is a photographic lens designed and patented in 1893 by Taylor who was employed as chief engineer by Thomas Cooke at the time. It was the first lens system that eliminated most of the optical distortion or aberration at the outer edge of lenses. In 1904, Taylor was issued a patent for a process that artificially aged optical lenses for the sole purpose of reducing reflections. Like many inventions, Taylor's discovery began as a happy accident. He noticed that some lenses that had been discarded outside had begun to oxidize. This "coating" that had begun to form seemed to reduce reflections. The rest is history.



Dennis Taylor

While working for Carl Zeiss in Germany, Olexander Smakula invented and developed the first interference-based coatings in 1935. These optical developments were mostly kept secret and used for military purposes by the Germans in World War II. Eventually, the Ukrainian scientist earned a professorship at The Massachusetts Institute of Technology (MIT) where he was renowned for his research on the crystalline lens. Though used for other purposes, AR coatings were first available on glass spectacle lenses in 1957. They were first available on plastic lenses in 1974. AR on spectacle lenses was initially referred to as a "thin film coating." This is quite appropriate since that's what it was/is. It is so thin that it is measured in angstrom units. One angstrom unit is equal to 1/10 of a billionth of a meter! Here's an analogy that might help: Imagine a brick wall that is 150 feet thick. One end of the wall is covered with wallpaper. That is the same proportional thickness of an AR coating applied to a 2mm-thick ophthalmic lens.

Oleaxander Smakula

How it Works

An anti-reflective coating (often called AR, anti-reflection, or “no-glare”) is a surface-applied thin-film system designed to reduce reflections and secondary images from the front and back surfaces of spectacle lenses.

Reflections occur at interfaces where refractive index changes, especially at the air–lens surface boundary. With common lens materials, a meaningful portion of light reflects off the lens surfaces rather than transmitting it to the eye. For CR-39, about 92% transmits and about 8% reflects from the two surfaces combined (near-normal incidence).

For higher-index materials, surface reflectance increases, which is one reason AR becomes even more valuable as index rises. Polycarbonate, for example, has reflectance at roughly 10.3% without AR.

AR coatings use multiple thin layers with different refractive indices, deposited in precise thicknesses. Layer thickness is engineered so that reflections from different boundaries cancel each other out (destructive interference), while transmitted light is favored.

When applied to spectacle lenses, AR coatings can reduce surface reflections to less than 1% of incident light.

Have you ever considered exactly what you are selling when presenting AR coatings to a patient? For example, I once heard a similar question posed this way: What is someone really buying when he or she purchases a drill bit? Answer: A hole. Think about that for just a minute.

In today’s marketplace, AR is rarely “just AR.” Most premium products are a coating *system*, commonly including a hard coat layer (scratch resistance and adhesion), several AR interference layers (reflection control), and a top coat engineered for cleanability and durability (often hydrophobic/oleophobic, sometimes anti-static). This is why modern premium AR lenses

are generally easier to clean and less prone to the "sticky smudge" problem that gave early AR a bad reputation.

Because lineups evolve, treat these as examples to help your staff understand "tiered" coating strategies from various manufacturers.

ZEISS

ZEISS DuraVision® Anti-Reflective Lens Treatments

ZEISS Product	Relative Tier	Primary Differentiator	Key Benefit to Patient	Best Suited For
DuraVision Chrome UV	Entry-level	Basic AR + UV protection	Reduced glare and improved clarity compared to uncoated lenses	Price-sensitive patients, backup pairs, first-time AR wearers
DuraVision Silver UV	Mid-level	Improved cleanability	Lenses stay cleaner and are easier to wipe off	Patients bothered by fingerprints and smudges
DuraVision Platinum UV	Upper-mid	Balance of clarity, cleanability, and durability	Clear vision with good long-term performance	Most everyday progressive and single-vision wearers
DuraVision Gold UV	Premium cosmetic	Extremely low residual reflection	Maximum transparency; lenses appear nearly invisible	Cosmetic-focused patients, professionals, public-facing roles
DuraVision BlueProtect UV	Premium specialty	Selective blue-violet light reduction	Reduced exposure to higher-energy blue-violet light while maintaining clarity	Heavy digital device users
DuraVision DriveSafe UV	Premium specialty	Enhanced contrast & reduced glare for driving	Improved visual comfort in challenging driving conditions, especially at night	Frequent drivers, night drivers

Essilor

Crizal® Anti-Reflective Lens Treatments

Crizal Product	Relative Tier	Primary Differentiator	Key Benefit to Patient	Best Suited For
Crizal Easy UV	Entry-level	Basic AR + UV protection	Reduced glare and improved clarity vs. uncoated lenses	Price-sensitive patients, backup pairs, first-time AR wearers
Crizal Alizé UV	Mid-level	**Discontinued in**	**January 2023**	
Crizal Sapphire (or Sapphire HR)	Upper-mid	Extremely low residual reflection	Maximum transparency; lenses appear nearly invisible	Cosmetic-conscious patients, professionals
Crizal Rock	Premium	Reinforced hard-coat durability	Superior scratch resistance and long-term performance	Children, active adults, patients hard on glasses
Crizal Prevencia	Premium-specialty	Selective blue-violet light filtering	Reduced exposure to higher-energy blue-violet light while maintaining clarity	Heavy digital device users
Crizal Rock + Prevencia *(where available)*	Top-tier	Durability + selective blue-light filtering	Combines toughness with blue-violet filtering	Patients wanting maximum protection and durability

Miscellaneous Brands

Miscellaneous Major AR Coating Manufacturers

Manufacturer	Common AR Family Names *(examples)*	Primary Emphasis	Key Patient Benefit	Best Described As
HOYA	Hi-Vision LongLife, Hi-Vision Meiryo, Hi-Vision BlueControl	Durability and long-term performance	Lenses resist scratching and stay clear longer with frequent cleaning	"Very tough, long-lasting no-glare lenses"
Younger Optics	Lab-branded premium AR systems (varies by lab)	Independent-lab flexibility and durability	Solid AR performance with good cleanability and compatibility with polarized lenses	"Reliable AR through independent labs"
Nikon Lenswear	SeeCoat Plus, SeeCoat Bright, SeeCoat Blue	Optical clarity and contrast	Reduced reflections and improved visual comfort, especially in demanding prescriptions	"Optics-driven clarity and contrast"
Rodenstock	Solitaire Protect, Solitaire LayR	Precision optics and premium cosmetics	High visual comfort with excellent cosmetic appearance	"European precision with premium clarity"
Tokai	Tokai premium AR systems (market-specific names)	High-index expertise	Reduced reflections in very high-index lenses where glare is more noticeable	"Specialists in high-index lens performance"
Independent Laboratories	Private-label AR systems	Tiered value options	Comparable entry, premium, and specialty AR options tailored to local labs	"Functionally similar AR at multiple price points"

Six Reasons Why More People Do Not Get AR on Their Eyeglasses

Despite decades of technological improvements and the well-documented visual benefits of anti-reflective lenses, a surprisingly large percentage of eyeglass wearers still choose lenses without AR. This is rarely due to a lack of value. Instead, it almost always comes down to how AR is presented (or not presented) during the dispensing process. Understanding these six reasons and recognizing how much influence the dispenser has over each one is the first step toward increasing AR acceptance.

1. The AR lens is not recommended by the prescribing doctor.

Patients place tremendous weight on what they hear in the exam room. When a doctor recommends no-glare lenses, even in passing, the patient arrives at the dispensing table expecting them. When that recommendation does not occur, AR can feel optional, cosmetic, or unnecessary. Dispensers who collaborate with prescribers and encourage consistent mention of AR when appropriate often see a noticeable increase in acceptance. Reinforcing the idea that the clarity experienced during the exam is partly due to minimized reflections helps patients understand why AR is beneficial in everyday eyewear.

2. AR is presented as the last option added to a basic lens.

When AR is introduced only after the lens choice and price have already been discussed, it is perceived as an add-on rather than a standard feature. At that point, patients are mentally committed to a price and are far more likely to decline additional options. Practices with higher AR percentages tend to introduce no-glare lenses early in the conversation and often bundle AR into their standard lens offerings. When AR is positioned as the norm rather than an upgrade, resistance drops significantly.

3. AR is referred to as a "coating."

Although technically accurate, the word "coating" carries negative connotations for many consumers. Patients may associate it with something thin, temporary, or prone to peeling or scratching. When dispensers refer instead to "anti-reflective lenses," "no-glare lenses," or "reflection-free lenses" shifts the focus to benefits rather than construction. If a patient asks directly whether AR is a coating, honesty should be paired with reassurance that modern AR systems are engineered for durability and supported by warranties. Leading with benefits prevents unnecessary skepticism.

4. AR is not presented with confidence.

Patients are extremely sensitive to a dispenser's tone, body language, and level of conviction. If AR is presented hesitantly or apologetically, patients will instinctively question its value. Confidence does not mean pressure; it means clarity and belief in the recommendation. Dispensers who understand AR, believe in its benefits, and ideally wear AR themselves tend to communicate that confidence naturally. When AR is recommended as a normal part of quality eyewear, much like UV protection, patients are far more receptive.

5. The AR discussion is abandoned at the first sign of objection.

Most patients who object to AR are not refusing it outright; they are asking for reassurance. Objections such as "they scratch," "they're hard to clean," or "I tried them years ago" are common and predictable. Dispensers who retreat at the first objection miss an opportunity to educate. Acknowledging the concern, explaining how modern AR differs from earlier generations, and mentioning warranty protection often resolves hesitation. Allowing a brief pause after addressing the concern gives patients time to reconsider without feeling pressured.

6. Features are stressed instead of benefits.

Patients do not buy layers, materials, or manufacturing processes. They buy comfort, clarity, and confidence. Overloading patients with technical details can create confusion rather than interest. When AR is explained in terms of real-world benefits like clearer vision, reduced glare, less eye strain, safer night driving, improved cosmetics, and (when applicable) blue-light filtering, it becomes immediately relevant and valuable to patients. Features should support the recommendation, but benefits are what ultimately motivate patients to say yes.

Two Bonus Suggestions: Remember that seminar where I conducted an informal survey about AR percentages. There were a few opticians who literally could not report what their percentages were. Why? Because they didn't know. Why? Because they don't keep track. Here are a couple of secrets:

First, even if you didn't make any changes or take anything in this module to heart, if you simply physically keep track of your AR sales – all other things being equal – you would probably see them increase. Relying on a monthly report from your organization doesn't count. I am referring to some sort of actual scoreboard that is posted in a public area where you and all your peers can see it.

Second, if you "publicly commit" to increasing your sales, that also sets yourself up for success. In other words, if you just sit in the privacy of your office and say to yourself, "I am resolved to improve my AR sales," maybe you will or maybe you won't. On the other hand, if you announce your specific plans and goals during a staff meeting, studies show you are more likely to succeed.

Taken together, these six (plus two) reasons reveal an important truth: increasing AR acceptance is rarely about changing the product itself. It is about refining the process, the language, and the confidence with which AR is presented. The following section builds on these ideas by outlining practical strategies and best practices that dispensers can implement immediately to improve patient understanding, satisfaction, and overall AR percentages.

Vital Information

Information is power. We've all heard that cliché, and most of us believe it's true. And while information is power, the *sharing* of information is power times 10. Here's some information worth sharing:

Any lens *material* can potentially be AR-treated, but not every lens is an ideal candidate. AR is usually compatible with most common ophthalmic materials. The most common "failure points" are not material, they are surface preparation, cleaning, edging/handling, and patient care. Remember too, that while some lens properties can be incorporated into the lens (UV absorbers, photochromic chemistry, and some filtering technologies), AR performance requires surface-applied thin films to reduce reflections at the air–lens interface. Regardless of any fancy language created by marketing professionals, AR IS a coating!

Understand the complications that can occur when adding an after-market AR to a lens that has been treated with an ultraviolet filter. Additionally, while most ECPs agree that patients should be discouraged from adding a fashion tint to their AR-treated lenses, sometimes they still want it. Some patients will insist on adding a pink 1 gradient tint! In the past, we've been instructed to simply tint the lenses a little bit darker than you want them to be in their final state. Recently, some more specific guidelines have emerged to control the outcome of the tint more accurately. Use the following five-step process:

- Tint the lenses about 35% darker than desired.
- Place the lenses in 200-degree Fahrenheit water for about half the time it took to tint them. Use 180-degree water if you're working with high-index or polycarbonate lenses.

- If a color shift occurs (and it probably will) tint them again, this time to @ 10% darker than desired. Then place them in the hot water again.
- Still allow for an overall slight residual color fade when adding AR, so finally tint the lenses to 5% darker than the final, desired color,
- Use only hot water (not neutralizer) to remove any excess color prior to adding the AR coating. Using neutralizer isn't recommended because it removes both the loose dye and locked-in dye too quickly. This will result in a less-than-expected final tint color.

Understand how it's all done. While *most* people only care about benefits, *some* people are curious about how it's done: The process used to apply anti-reflective coating varies depending on the manufacturer. In some cases, the coating is sprayed on in liquid form, then exposed to high heat so that the liquid solution hardens and adheres to the lens. Another process coats each lens with a liquid and places it inside a vacuum chamber, where the vacuum process hardens the coating. In yet another process the anti-reflective coating is built into the material and distributed throughout. Multiple layers of various metal oxides enhance the properties of the anti-reflective coating, including oil-resistant, water-resistant, static-resistant, and protective scratch-resistant layers. The high-tech machinery needed to apply today's AR coatings can easily cost upwards of $1 million.

The process begins with a detailed inspection of the lens surface. Even if any minor scratches or imperfections are present, the process is compromised. Several cycles of intense and thorough ultrasonic cleanings follow. The lens is then placed in a degassing oven to ensure that all moisture has been removed. Most vacuum coating machines have a rotating lens rack at the top of the unit. Monitoring devices measure coating thickness. The computers measure the change in the frequency of an oscillating quartz crystal. The frequency of the crystal adjusts as the coating builds on its surface. The mechanical energy is changed to electrical energy, and all that information is monitored by computer for precise layer thickness. The formulation of the materials evaporated onto the lens is proprietary and different for each manufacturer. An electron-beam gun evaporates the materials to be used in the coating application. Vaporized molecules travel through the chamber and adhere to the lens surface. In a multiple-layer coating system the computer controls the time and sequence of the deposition of coatings per side during the entire process. At this part in the process if you were to examine the lens microscopically, you would discover a very porous surface. That is why early generation AR lenses *were* hard to clean, etc. That is why most modern AR processes now add a couple of final coats – one that is oleophobic and one that is hydrophobic. The entire product is then hardened to ensure maximum performance.

Consider using AR strippers in your office. As reliable and scratch resistant as most AR lenses are these days, every once in a while, a patient will still manage to scratch them – especially lower-quality ones. Luckily, most AR lenses have a generous replacement warranty. Some are guaranteed for one year; others for two years. Some are also guaranteed "for the life of the prescription." Obviously, if they need to be replaced and they're still under warranty, it should be communicated to the patient how fortunate it is that they have AR lenses, and how

without it the lenses would not have been able to be replaced at no charge. But what if the lenses are out of warranty? What if the scratched AR lenses belonged to someone who was not your client when they purchased the lenses? If you use AR stripper in your office you now can say, "You're lucky. You have anti-reflective lenses. That's the only type of lens that we can sometimes remove scratches from! Allow me to explain…" For further information on stripping, take a few minutes to read an article I wrote for *Eye Care Professional* magazine called "The Case for Stripping." You may request a copy of it by e-mailing me at: anthony@opticalseminars.com

Here is a copy of the MSDS (Material Safety Data Sheet) for the AR stripper that is sold by Brain Power Inc. – an industry leader in tinting supplies. An MSDS outlines handling instructions, disposal guidelines, and lists any known harmful effects of using a given substance. Take a few minutes to review the safety considerations when using their stripper:

http://www.callbpi.com/pdf_file/ar_dry.pdf

Be aware of further benefits to your patients:

- AR provides lenses that will reduce fatigue and eye strain. Reflections get in the way of crystal-clear vision, which means your eyes must work harder. Since lenses are more difficult to scratch, they stay clearer longer.
- Remember that in general, people who are 65 years of age and older require more than six times the amount of light as an 18-year-old to perform the same task.
- Vision is clearer – especially at night. AR coatings improve contrast. Halos around car and streetlights are virtually eliminated. Smaller images are visible sooner, thus improving reaction time. This greatly improves safety in general. There are also several studies you can refer to which will more fully explain the connection between wearing AR lenses and automobile safety. For example, after a month of using AR lenses and a month of using non-AR lenses, participants in a study conducted with Missouri Highway Patrol officers, the troopers all reported increased acuity with both day and night vision. An Indiana State University study showed greatly improved contrast sensitivity and reaction time when people were wearing AR lenses in situations that simulated night driving.
- An average windshield absorbs as much as 20% of ambient light. No wonder so many of our patients tell us they never drive at night!
- Patients will look marvelous! Friends and colleagues will notice them and their eyes – not the annoying and distracting reflections on their lenses. Communication is easier when you can clearly see another person's eyes. Thick lenses do not reflect as much light, so the "coke bottle" effect is far less noticeable. The lenses will appear thinner.

Best Practices

- Have effective props for demonstration purposes. A pair of glasses in a thin metal frame in which one lens has been treated with AR, and the other has not is a highly effective tool for demonstrating the cosmetic advantage of AR and in turn, increasing sales. Both Essilor and Carl Zeiss have demonstrator lenses that are also very effective. They are 70 mm plano plastic lenses with an area about the size of a half dollar in the center. Only the center section has been treated with AR. It appears there is a hole in the center of the lens. Patients are usually amazed to discover there is no hole.

- Create written sheets for your patients that outline the care and maintenance of AR lenses.

- Have a damaged pair on hand. This suggestion works well with the above suggestion. In other words, as you hand the patient the sheet that explains the care and maintenance, be sure to show them the damaged pair, saying something like, “and this is what will happen if these guidelines aren’t followed.”

- Wear them yourself. This is perhaps the most effective :silent script.”

- Two final thoughts: Consider the title of this module: Increasing AR Percentages. If you truly wish to see an improvement in your current AR rate keep these two things in mind: First, if you always do what you’ve always done, you’ll always get what you’ve always got. Which means you must do *something* different than you do now if you wish to see different results. Second, do not pick and choose…do not pre-judge. In the absence of a specific contraindication, consider every single one of your patients to be prime candidates for AR. After all, they probably ARe!

Additional Resources

- www.optiboard.com
- www.allaboutvision.com
- www.crizalusa.com
- https://www.advanceoptical.com/library
- www.transitions.com
- *On Light and Other High Frequency Phenomenon* by Nikola Tesla

Final Assessment

1. Which concept best explains how thin-film AR reduces reflections?

   a. Diffusion scattering
   b. Destructive interference
   c. Total internal reflection
   d. Photochromic activation

2. For a CR-39 lens (uncoated), total reflection from the two surfaces combined is approximately:

   a. 2%
   b. 4%
   c. 8%
   d. 12%

3. AR coatings are applied primarily to:

   a. The lens center only
   b. The inside of the lens material
   c. The lens surfaces (front and back)
   d. The frame bevel

4. Without AR, which material tends to show *more* surface reflectance (all else equal)?

   a. Lower-index plastic
   b. Higher-index plastic
   c. Trivex only
   d. Polarized lenses only

5. Which group may notice spectacle reflections more when switching from contact lenses to glasses?

   a. Presbyopes
   b. Hyperopes
   c. Contact lens wearers
   d. Children

6. Which dispensing approach is most associated with higher AR adoption?

   a. Presenting AR as an afterthought add-on
   b. Presenting AR as a default/standard option (when appropriate)
   c. Avoiding AR on high-index lenses
   d. Only recommending AR for cosmetic reasons

7. Which is a common reason patients decline AR?

    a. It changes the prescription power
    b. The optician abandons the discussion after the first objection
    c. AR prevents UV from entering the eye completely
    d. AR is illegal in some states

8. Which statement is most accurate?

    a. AR is "built into" the lens material
    b. AR is a surface-applied thin-film system
    c. AR only works on glass lenses
    d. AR works by darkening the lens

9. When applied properly, AR can reduce surface reflections to roughly:

    a. Less than 1% per surface
    b. 5% per surface
    c. 10% per surface
    d. 20% per surface

10. Which is an example of a *benefit* (not a feature) you should emphasize to patients?

    a. "It has multiple layers."
    b. "It uses metal oxides."
    c. "It reduces distracting glare and improves comfort."
    d. "It is deposited in a vacuum chamber."

11. Which patient-care instruction best protects AR performance long-term?

    a. Clean and dry using a paper towel
    b. Use very hot water and ammonia cleaners
    c. Rinse debris off first, then use mild soap and a clean microfiber
    d. Store glasses on a car dashboard to "dry them out"

12. A major reason AR is especially valuable on higher-index lenses is:

    a. Higher index always means less reflection
    b. Higher index typically increases surface reflectance without AR
    c. Higher index eliminates glare entirely
    d. Higher index blocks blue light automatically

13. Which is a common “presentation mistake” that reduces AR percentages?

    a. Using a demo lens
    b. Bundling AR
    c. Pre-judging who “won’t buy it”
    d. Explaining benefits

14. Which top-coat property is most associated with repelling water?

    a. Hydrophobic behavior
    b. Photochromic behavior
    c. Polarizing behavior
    d. Bifocal behavior

15. Which top-coat property is most associated with resisting oils/fingerprints?

    a. Oleophobic behavior
    b. Prismatic behavior
    c. Chromatic behavior
    d. Hyperopic behavior

16. Which statement is true about modern AR and daily activities?

    a. Most wearers report worse comfort with AR
    b. Many wearers perceive reduced glare and better comfort for daily tasks
    c. AR only helps in bright sunlight
    d. AR only helps cosmetically

17. Which scenario most risks coating damage?

    a. Cool rinse and microfiber dry
    b. Mild soap and lukewarm water
    c. Leaving glasses in high heat (e.g., dashboard)
    d. Storing in a hard case

18. Which statement is false?
    a. AR can reduce surface reflections substantially
    b. AR can improve perceived clarity/comfort for many wearers
    c. AR eliminates the need to clean lenses
    d. AR is applied to lens surfaces

19. Which is NOT one of the “Six Reasons” discussed in this course?

    a. Doctor doesn’t recommend it
    b. AR presented last as an add-on
    c. The optician abandons after the first objection
    d. AR changes the prescription power

20. The best overall way to increase AR percentages is usually:

    a. Talk less about AR
    b. Mention AR only if the patient asks
    c. Improve the process: default framing + benefits + handling objections + team consistency
    d. Avoid props and written care instructions