

- **Largest selection of designs, 193-2200nm**
- **User-specified wavelength regions**
- **Optimized design is automatically provided on CVI partial reflectors, beamsplitters, and dichroics**
- **Single layer, V-type, BBAR, and special designs**
- **R < 0.25%, 0°, at single wavelengths**
- **R < 0.5% average, 0°, over wide ranges**
- **Coatings available optimized for 45° with high durability and damage threshold**
- **User-supplied and CVI substrates**

Antireflection (AR) coatings are required to reduce overall transmission loss, minimize stray light, and prevent back reflections. Stray light in the wrong place can swamp the desired signal, making a measurement impossible. Reflected laser beams can burn absorbing surfaces, form unwanted foci, and pose safety hazards, while back-reflected beams can destabilize laser oscillators. For these reasons, obtaining the proper AR coating can be a critical factor in system success. CVI offers over thirty years of experience in helping scientists and engineers choose the proper AR coating for optimum performance.

CVI can provide a standard or custom design to solve almost any AR coating requirement. Single layer and multiple layer designs are available from 193nm to 2200nm. CVI antireflection coatings are the most durable and damage resistant in the industry, and we have much experience in redoing the work of others in this regard. We accept customer-supplied lenses, windows, prisms, laser rods, and other types of substrates for AR coating.

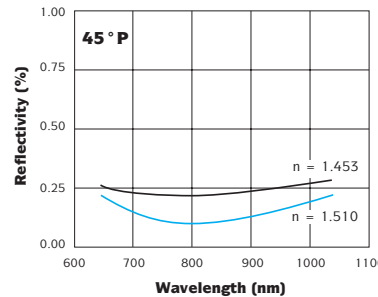
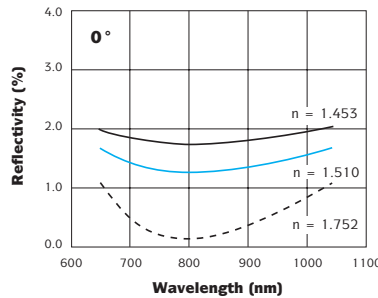
When ordering, be sure to specify the following:

- **Wavelength**
- **Substrate material or index of refraction**
- **Angle of incidence with respect to normal**
- **Polarization**
- **Fluence in J/cm<sup>2</sup>**

Antireflection coatings can be divided roughly into 4 categories: Single layer AR coatings, V-type AR coatings, BBAR coatings, and special purpose AR coatings.

## 1. Single Layer MgF<sub>2</sub> Coatings

- **R < 0.25%, 0°, over wide ranges on sapphire, Nd:YAG, and high index glasses**
- **R < 0.25%, 45°P on glass and fused silica**

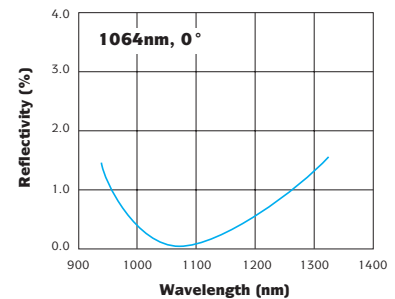
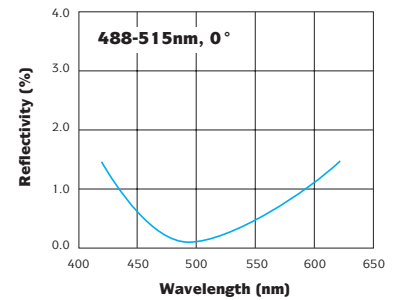


The CVI single layer MgF<sub>2</sub> AR coating is an excellent choice for use on high index materials at normal incidence. Such materials include sapphire, Nd:YAG, ruby, and SF10 and SF11 glasses. On ordinary glass or fused silica, the MgF<sub>2</sub> index of about 1.38 is too high to provide a good

impedance match at the air-glass interface, yielding a residual reflectivity of about 1.3%. For these materials, V-type and BBAR coatings with reflectivities from 0.25% to 0.5% are the best choice at normal incidence. Shown below left are graphs of the performance of MgF<sub>2</sub> on different materials at normal incidence, and at 45°P on glass and fused silica.

## 2. V-type Antireflection Coatings

- **R < 0.25% at design wavelength, 0°**
- **R < 0.75% at design wavelength, 45° unpolarized**
- **Included on the second surface of all CVI single line beam splitters and partial reflectors**
- **All laser wavelengths available**
- **Highest durability and damage threshold**

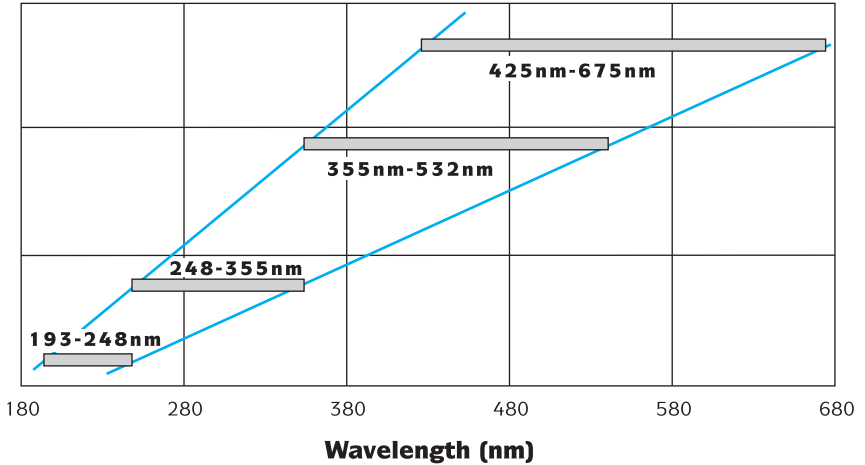


CVI's V-type AR coatings are the best choice for a single laser wavelength or multiple, closely-spaced wavelengths. Examples are the principle argon laser lines at 488nm and 515nm, the neodymium transitions in a variety of host materials at 1047-1064nm, and the individual excimer laser lines.

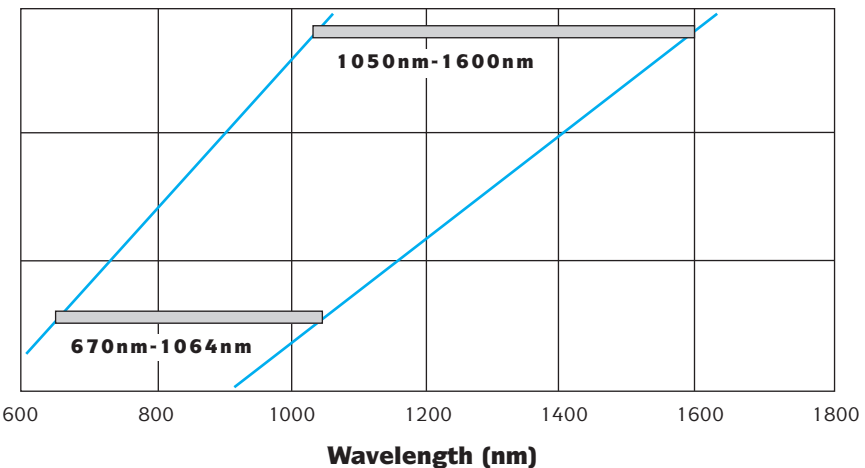
CVI will manufacture V-type AR coatings for any wavelength from 193nm to 2200nm.

### 3. Broadband Antireflection Coatings

- R < 0.5% average over very wide ranges
- Six standard designs covering UV to IR
- Designs effective at 0° or at 45°
- Custom wavelength bands available
- Low temperature fiber and optic broadband AR  
R < 1.25% average



BBAR UV and Visible Region



BBAR NIR Region

CVI offers broadband antireflection (BBAR) coatings optimized to your specifications over the entire range of 193nm to 1600nm. The performance of six standard designs at normal incidence is shown on the following pages. A selection chart is provided to assist you in specifying a non-standard range.

If your tuning range or wavelength band falls within the bold lines on the selection chart, CVI can manufacture a special BBAR coating for you.

*continued*

BBAR coatings are designed by inserting a half wave thick "absentee" layer between the layers of a V-type AR coating. This dramatically broadens the range of effectiveness of the AR coating. CVI guarantees that the average reflectance of most BBAR coatings will be less than 0.5% at normal incidence.

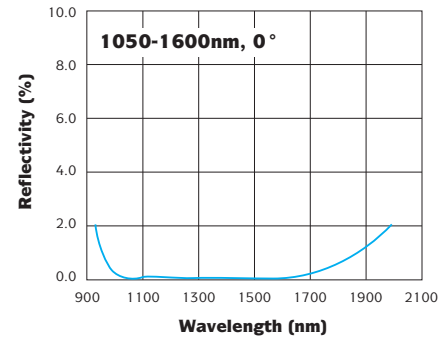
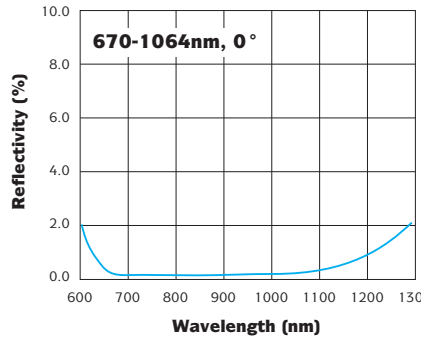
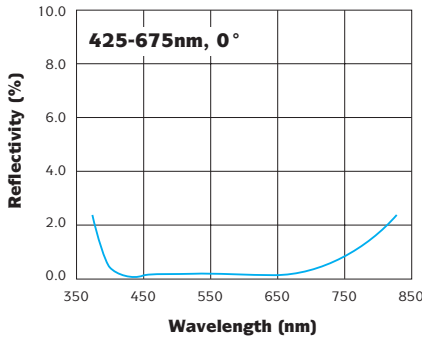
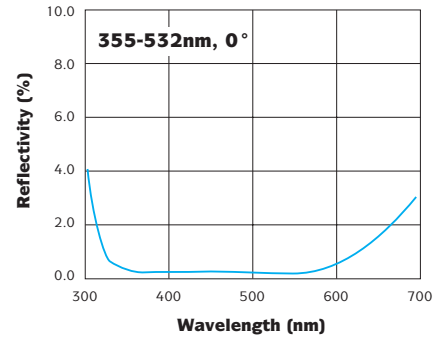
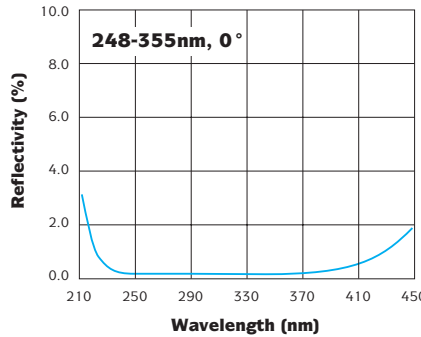
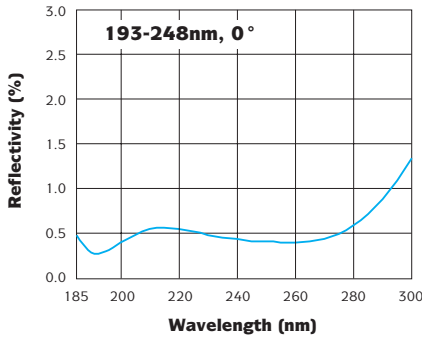
For the lowest possible reflectance at a single wavelength, the V-type antireflection coating is the best choice. In many applications, however, the BBAR coating will work extremely well, with the added advantage of a wider, useful range.

## BBAR Selector Data - UV and Visible Regions

CVI offers four overlapping standard designs, covering the entire range 193nm to 675nm. Typical performance curves at normal incidence are shown in the graphs below. Many research and instrumentation applications can be covered by a single judicious choice of region. If your application cannot be covered by a standard design, verify that the desired range fits between the bold lines in the selection chart shown on [◀ 357](#) and CVI will provide a special BBAR coating design.

## BBAR Selector Data - NIR Region

Very broad coverage of the entire Ti:Sapphire region, as well as the near IR to 1600nm is available from the two standard CVI BBAR coatings shown below. Typical performance curves at normal incidence are shown in the accompanying graphs. If your application cannot be covered by a standard design, verify that the desired range fits between the bold lines in the selection chart [◀ 357](#) and CVI will provide a special BBAR coating design.



## 4. Double-V AR Coatings

- Available at Nd:YAG wavelengths 1064nm, 532nm, and 355nm
- Double-V:
  - R < 0.3% at 1064nm, 0°
  - R < 0.6% at 532nm, 0°

CVI offers Double-V coatings for use in Nd:YAG laser systems at normal incidence. Highly damage resistant, electron beam deposited dielectrics are used exclusively as coating materials. As shown in the curves below, the antireflection peaks at the harmonics are quite narrow. Also, due to the coating design and dispersion, they do not fall exactly at

a wavelength ratio of 1 : 1/2. Consequently, the reflectivity specifications of these AR coatings are not as good as V coatings for one wavelength. CVI provides harmonic windows with these coatings, the HW2 series, in all standard sizes. Contact CVI for the performance of 45° Double-V coatings.

