Re: Glass Absorbs light?

Source: http://sci.tech−archive.net/Archive/sci.astro.amateur/2004−11/3083.html

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Date: 11/20/04

Date: Sat, 20 Nov 2004 03:50:47 GMT

On 19 Nov 2004 19:28:53 −0800, ssmartin5@aol.com (Stan Martin) wrote:

>1) If glass does indeed "absorb" light, then I would assume the blame
>would be placed either on some type of internal scatter or possibly a
>property of the glass which converts some portion of light energy into
>heat. In either is indeed true, I'm certain that it has been
>measured and I would be curious of what type of percentage loss p/inch
>of glass vs. glass types, etc.

No material is perfectly transparent. Glass contains scattering centers, and is absorptive. It is a real problem in high energy laser labs, where even very, very high quality glass optics can be destroyed (sometimes explosively!) by the tiny fraction of a percent of energy that is absorbed and converted to heat. Common glass like that used in windows is not very transparent− almost all light is absorbed by just a few inches. Optical quality glass is much better− a typical telescope objective absorbs less than 1%. The glasses used in optical fibers are the best made, absorbing only a few percent per kilometer.

Keep in mind that no material is perfectly reflective, either. So while refractive optics experience some loss due to reflections from surfaces and from internal absorption, reflective optics experience losses from absorption at their surfaces.

>2) The second question is also applicable to prisms and lenses. It
>seems obvious enough for the need of AR coatings on the entrance face
>of a given optic to reduce light scatter. It is harder for me to
>understand the need of those coatings on the exit face of an optic
>such as a prism. I'd specifically refer to a single element
>optic where there are no opposing air/glass surfaces which would
>produce reflections. This question arises from my understanding that
>the internal reflection of the light path in a prism is unaffected by
>external coatings but rather by incident angle alone.

You get reflection at every interface where there is a change in the index of refraction. That means at the entrance surface of an optic, and at the exit surface. So both need to be coated− the first to reduce light loss from reflection back towards the source, and th