

From: Mark.Gross@csiro.au
Subject: RE: BS - AR coating design - is it OK to share for analysis?
Date: July 16, 2012 at 1:28 AM
To: billingsley_g@ligo.caltech.edu
Cc: Phil.Martin@csiro.au



Hello GariLynn,

The AR coating that we are using for all but the BSs and ERMs comes from "AR_Coatings 101". It is the simplest design (2 layers, HL) that can theoretically achieve zero reflectance at one wavelength (the one-layer design requires an exactly index-matched coating material) - there being no other specs, we decided that would be the easiest thing to do.

The coating can be 'configured' several ways (all well known) - ie. thin H - thick L, or thick H - thin L or 1/2 waves added to the basic thicknesses. The best design is the thin H - thick L design since it has the broadest peak and is therefore more tolerant to deposition errors than the other alternatives.

The exact thicknesses depend on the refractive indices of the materials. In our case it is ~44 nm of TaOx and ~240 nm of SiOx.

Note: it is possible that the 'thin TaO layer' absorption issue may be related to the way it is deposited as much as anything else (like annealing etc) - ie. experimenting with the deposition conditions might 'fix' this problem. Also, where thick becomes thin (or v.v) is also somewhat undefined. All we can say is that when thick layers (say ~100nm) of TaO were used we had less difficulty getting low absorption than when thin layers were used (~40 nm). That's not to say that we can't get good absorption - it's just less reliable. 'Uncoated' TaO layers seemed to cause less trouble than those covered with silica.

Mark Gross
Materials Science and Engineering Division
Commonwealth Scientific and Industrial Research Organisation
Bradfield Rd
West Lindfield, NSW, 2070, Australia
ph +612 9413 7525
email: mark.gross@csiro.au

-----Original Message-----

From: GariLynn Billingsley [mailto:billingsley_g@ligo.caltech.edu]
Sent: Saturday, 14 July 2012 7:55 AM
To: Gross, Mark (CMSE, Lindfield); Martin, Phil (CMSE, Lindfield)
Cc: Harry Gregg; Phelps Margot
Subject: BS - AR coating design - is it OK to share for analysis?

We are trying to generate interest in investigating the absorption behavior of thin Tantalum. We have some of our collaboration members interested in taking this on. They would need the explicit AR design in order to proceed. Would you be willing to share this?

A word of caution; one of these chaps is known to be incapable of discretion... ie. you should assume that the design would end up spread around the world.

alternately, we could perhaps just tell them the thickness of the Tantalum layer (which we think is the culprit) and let them design something for test using silica.

The process will be to probe the sensitivity of absorption to Tantalum thickness.

If I recall correctly, you did extensive studies of Tantalum ALONE and found (with Ashot) an annealing temperature that did not work well once it was contained within a coating?

Best regards,
Gari

