

Subject: Re: epoxy resin for VM dampers

From: Dennis Coyne <coyne@ligo.caltech.edu>

Date: Tue, 16 Dec 2008 09:02:51 -0800

To: Alberto Vecchio <av@star.sr.bham.ac.uk>

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Reference L0810022-v1

Hello Alberto,

LIGO has no experience (to my knowledge) with sealing a volume of gas (and outgassing organics) with epoxy. Use of epoxy for sealing is not (generally at least) considered ultra-high vacuum (UHV) practice. I strongly urge a method of higher reliability. For example, we seal our photodiode pre-amps by e-beam welding the enclosure and vacuum electrical feedthrough. Rich Abbott can provide details and a source(s) for this method of sealing.

see also pg 6 of

<http://www.ligo.caltech.edu/docs/G/G080011-00.pdf>

and pg 38-41 of

<http://www.ligo.caltech.edu/docs/T/T070247-01.pdf>

Neither of the epoxies that you mention below have been tested and approved for use in LIGO. The LIGO testing takes 2 to 3 months and there is a queue of other materials being tested at the moment. We can perform an RGA test within a week of receiving a sample(s), but measurement of scattering and absorption loss at the ~1 ppm/yr level requires 2 to 3 months of exposure testing in a high irradiance optical cavity.

I have copied the Vacuum Review Board members in case any of them disagree with me or have other advice. I will also log this VRB question on the VRB log:

http://lhocds.ligo-wa.caltech.edu:8000/advligo/System-wide_Information/VRB

Dennis

Alberto Vecchio wrote:

Dear Dennis,

We have an outstanding issue - related to vacuum compatibility - concerning the production of the VM prototype which concerns the epoxy resin for:

- (i) sealing the Violin Mode detector/emitter enclosures,
- (ii) sealing around the enclosures' Martec feedthroughs, and
- (iii) making the vacuum seals at the glass-metal interfaces of the enclosures' windows.

This is now on the critical path. After discussions with Stuart, Nick had selected

- (1) Hysol Epoxy #4215 (black).

He sent you an email a couple of weeks ago enquiring whether it can be used for the prototype, but hasn't heard yet from you. In the meantime, Nick has looked at possible alternatives:

- (2) an 'embedding' resin designed to penetrate into fine cracks (so should be good for sealing), and it is used for holding SEM samples, under vacuum, with minimal contamination.

<http://www.emsdiasum.com/microscopy/technical/datasheet/1232.aspx>

- (3) A NASA-approved epoxy that is particularly suitable for High Vacuum use. It is Master Bond EP21TCHT-1 epoxy

<http://www.masterbond.com/tds/ep21tcht-1.html>

Could you let us know whether you can authorise the use of any of these resins for the prototype? We will then make plans for the production units.

Thank you very much,

alberto.