U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

1200 New Jersey Ave, S.E.
Washington, D.C. 20590

JUL 20 2009

Mr. Michael Trembley
Cabot Microelectronics
870 N. Commons Drive
Aurora, IL 60504

Ref. No. 09-0067

Dear Mr. Trembley:

This responds to your March 19, 2009 letter requesting clarification of requirements in the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to intermediate bulk containers (IBCs). Specifically, you ask if it is permissible to use vented caps to prevent hydrogen gas build up in an IBC to meet the provisions concerning venting in §173.24(g)(2).

According to your letter, you plan to use a vented cap (e.g., G2 Plug Silicone Vent #481645 or equivalent) on an IBC containing a non-hazardous, water-based product to prevent the build up of hydrogen in the head space of the container. You state that hydrogen levels in excess of the 4% Lower Explosive Limit (LEL) concentration can build up over time inside a closed container such as an IBC and suggest that the use of a vented cap would prevent this from occurring.

The answer is yes. It is the opinion of this Office that the use of a vented cap as described above to prevent hydrogen gas build up in the IBC is permissible, and does not constitute a design change that would necessitate retesting of the IBC. Please note that any change to the originally produced packaging involving structural design, size, material of construction, wall thickness, or manner of construction would constitute a design change that would require completion of the tests set forth in Subpart O of Part 178 of the HMR.

I hope this answers your inquiry.

Sincerely,

Charles E. Betts
Chief, Standards Development
Office of Hazardous Materials Standards

Boothe
§173.24(g)(2)
Packaging
09-0067

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March 19, 2009

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Admin (PHH-10)
Office of Hazardous Materials Safety
1200 New Jersey Avenue, SE East Building, 2nd Floor
Washington, DC 20590

Attn: Mr. Edward T. Mazzullo, Director
Office of Hazardous Materials Standards

Subject: Interpretation Request for 49 CFR 173.24(g)(2)

Dear Mr. Mazzullo,

Pursuant to an informal telephone conference call conducted on March 11, 2009 between Roy Marshall, on the behalf of Cabot Microelectronics Corporation, and Shane Kelley, we formally request your assistance on a shipping matter related to the use of vented caps.

Specifically, we would like to know if it is permissible to use a vented cap (e.g. G2 Plug Silicone Vent #481645 or equivalent) on a packaging (e.g. an Intermediate Bulk Container) containing a non-hazardous, water-based product to prevent the buildup of hydrogen in the head space of the container if the vented hydrogen gas will never reach the Lower Explosive Limit (LEL) of a 4% concentration with air in the transport vehicle or freight container.

Currently, hydrogen levels in excess of the 4% LEL concentration can build-up over time inside a closed container such as an Intermediate Bulk Container. The use of a vented cap would prevent the build-up of hydrogen inside such a container thus preventing the 4% LEL concentration from being reached.

While the initial guidance we received from the U.S. Department of Transportation seems favorable (i.e. a vented cap would be permissible under the circumstances described in the second paragraph above), we respectfully request a formal written interpretation of the permissibility of vented caps (as discussed in paragraph two above) in accordance with 49 CFR 173.24(g)(2).

In addition, we have included a copy of the initial information provided to the U.S. Department of Transportation and examples of the Intermediate Bulk Container ventilation system caps under consideration.

Thank you for your help in this matter.

Sincerely,

Michael Trembley

Michael Trembley
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Email- michael_trembley@cabotcmp.com

Hydrogen/Packaging Issue

We need help to determine what our options are in terms of eliminating the headspace build-up, proper classification, interactions with the DOT, any exemption opportunities, etc.

Assuming the containers are hazardous, we need to be able to ship by ground and water. Air is not required, but if possible would be nice to have. Our internal policy is to ship Cargo Aircraft only. No passenger aircraft even if legally allowed.

Packaging specs: We typically use 5-gallon plastic jerricans (3H1), 55 gallon drums (1H1) or tote (31HA1)

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We have a product that is non-hazardous. This is a water-based product that is not flammable, corrosive, oxidizing, etc. Essentially it is used as part of a wire saw process to cut silicon ingots into thin wafers. As a result of this process, small bits of the silicon mix with the product. This material is re-used a number of times until the product becomes 'saturated' with enough silicon that it no longer can effectively cut the ingots via the wire saw process. This spent material is collected as it has the potential to be recycled and re-used.

This material is also water based, not flammable, corrosive, oxidizing, etc. and is considered in itself non-hazardous. However, there is a reaction occurring between the silicon particles and the water. The silicon reacts with the water to form silicon dioxide and hydrogen gas. The hydrogen gas accumulates over time in the headspace of the containers- drums, jerricans and IBC type totes. The levels of concentration of H2 measure in the closed containers varies based on time, headspace volume and amount of silicon present in this spent material, and have been measured from 34%-75%. Once the cap is removed from the container, the H2 disperses quickly to atmosphere to levels below the LEL. Some initial measurements on drums that were initially stored using vented caps and then re-sealed for subsequent measurements:

	Slurry Height in Drum	Immediate Hydrogen	Hydrogen after 1 minute	Hydrogen after 30 minutes	Hydrogen after 60 minutes
Drum 1	Very Full 2" from top	34%	6.3%	1.0%	0.8%
Drum 2	Full 6" from top	75%	49%	1.1%	0.5%
Drum 3	About Half full	54%	36%	6.4%	2.9%

As you probably know, H2 has an LEL of 4%. From our measurements, we have determined that the reaction of the silicon with the water is generating H2 in levels above the LEL and creating a flammable headspace.

We need help to determine what our options are in terms of eliminating the headspace build-up, proper classification, interactions with the DOT, any exemption opportunities, etc.

One of the options we are interested in exploring is the use of a vented cap that allows an 'air exchange' between the headspace and the atmosphere. The thought that if this reaction were allowed to vent, then the LEL would not be reached in the headspace and thus it would be non-hazardous. We are not sure if this is permitted by the DOT or would require an exemption of some sort by the DOT and would like your assistance on that question as well.

We were able to obtain a Letter of Interpretation from the DOT that is almost spot on to our situation. The L of I relates to rail cars, but the H2 reaction issue is exactly the type of scenario we have. This has given us some guidance, but takes us down a path that essentially prohibits from using jerricans, drums and totes if I

am understanding the packaging instructions correctly. I have attached for your review.

Possible solutions to consider:

1. Vented Caps- is a vented cap that allows for pressure release and air exchange permitted that prevents the build-up of hydrogen above the LEL in the headspace of the container.

Also, can you look at the attached photos related to 2-way vented caps. It appears these are UN approved and allow for air exchange. These would allow the H2 reaction to vent and disperse to air thus potentially eliminating the H2 generation in the headspace creating a flammable atmosphere. These are used with the totes. Markings on the caps: UN31HA1/Y/USA/+AA2503 Leak Proof Inspection. Is this type of cap in general an option for us?

2. Overpack- can a jerrican of material be placed inside a larger overpack (85 gal) drum that could contain any released hydrogen from the jerrican within the overpack headspace. Also would prevent any potential spillage from jerrican depending on type of cap used.

3. Freezing- could freezing of material which would prevent hydrogen reaction from occurring be used. Material would be shipped as a non-haz solid in jerrican, drum or tote.

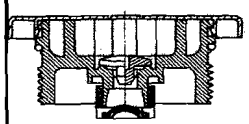
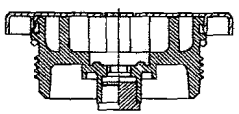
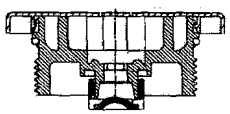
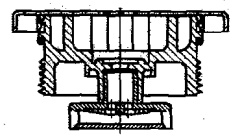
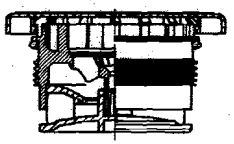
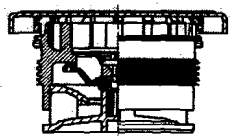
To confirm, mode of transportation within the U.S. would be ground. Internationally, would need to be able to ship by water. No air shipping expected at this time.

From our perspective, the use of an appropriate cap that allows air exchange and venting is the preferred choice. It looks like there may be some options based on some cap information I had sent to you last week. Also, looking at any suggestions you might have that we are missing. Basically, we are looking for ways to get the hydrogen out of the container so that the LEL is not reached while still in compliance with DOT.

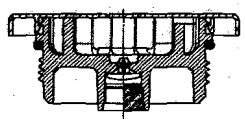
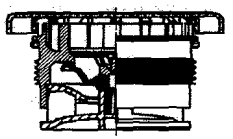
We are also looking at reformulation options but are somewhat limited right now because we cannot move the material where it needs to go for evaluation and more testing. Namely, from our customer site back to our site. Thanks.

IBC ventilation systems

ventilation systems - areate and deareate

G2 plug silicone-vent (alternative EPDM) vent Ø19	G2 plug VENTIX SS-Schuetz -40	G2 plug Gore Ø12	G2 plug Gore DURAVENT D38 black	G2 plug Gore Ø34	G2 plug (Breather +) NBR-membrane vent Ø12
3-4277 / #481645	3-8172 / #3004534	3-4277 / #486876	3-8891 / #1270729	4-5039 / #1199099	4-4121 / #913197
					

ventilation systems - areate

G2 plug VENTIX SS-Schuetz-100 vent Ø12	G2 plug (Breather) NBR-membrane
3-8861 / #3006747	4-3754 / #852430
	

properties

UN-certification							
yes	yes	yes	yes	yes	yes	in preparation	yes
pore size [µm]							
—	40µm	0,45µm	1µm	0,45µm		100µm	—
air flow [l/h bei 25 mbar]							
to outside (deareation)							
300 l/h	17 l/h	6,5 l/h	35 l/h	110 l/h	1,8 l/h bei 50mbar	—	—
to inside (areation)							
300 l/h	17 l/h	6,5 l/h	35 l/h	110 l/h	**150 l/min**	70 l/h	**150 l/min**
features							
	oleophob	bacteria barrier hydrophob	hydrophob	bacteria barrier hydrophob			
special use							
—	—	—	—	for strong gasing material (e.g. hydrogene-peroxide)	discharging without opening of screw cap		discharging without opening of screw cap
warm filling is possible				warm filling is possible	warm filling is possible	warm filling is possible	warm filling is possible

mentioned article numbers are with LUCALEN gaskets
additional gaskets are available