

Why Cyalumes® and Other Chemical Light Sticks Make Poor Backup Lights

By Henry Schneiker
September 1999

Cyalumes and other chemical light sticks appear to be the ideal backup light source. They are small, light weight, waterproof, self contained and will generate light for hours once they have been activated. The chemicals are encased in a tough soft plastic and the chemicals inside are not harmful even if they do leak out. They even come in a wide range of colors. But looks can be deceiving.

Years ago when Cyalumes first came to market, the cavers doing expedition work down in Mexico figured these new chemical light sticks were a wonderful technology. You could throw several in your cave pack and should the need arise, just pull one out and activate it.

So one day deep in a cave system we got into a discussion about just how good Cyalumes really were. As the discussion progressed, one person volunteered to do a test on the way out, using only a Cyalume from his pack. A Cyalume was retrieved from his cave pack, unwrapped and activated. Nothing. OK, no problem. After all, that is why we carry more than one. A second Cyalume was extracted from the pack, unwrapped and activated. Again, nothing. The last Cyalume in his pack provided equally disappointing results.

One by one, everyone delved into their packs and tried their Cyalumes. We activated a total of 14 Cyalumes and not a single one worked! The Cyalumes had been in the packs ranging from weeks to months. Most were from a new case delivered just before the expedition.

When we got back to the surface, we tried several Cyalumes from the new case and they all worked straight from the case.

Over the next several days we identified the two probable causes for the Cyalume failures. First, the Cyalumes were not protected from bending so we figured accidental activation was a major cause of problems. Second, the foil pouch is designed to exclude oxygen and since the Cyalumes were not protected, the foil pouch could have been damaged allowing oxygen to enter and thus consume the chemicals over a period of weeks to months.

The fix seemed easy enough. Saw up some lengths of 3/4" aluminum conduit, insert the Cyalume package and duct tape the ends. Nothing could damage the foil package and nothing could bend the Cyalume to activated it.

The very next expedition, everybody was back underground with the armored Cyalumes, confident in their reliability. Until the last day underground while derigging the cave when the same discussion came up and someone again volunteered to exit on only the light of the Cyalume. After trying 10 Cyalumes, we finally got one to work. Not even the armor plating had fixed the problem.

It was obvious we still did not understand all of the failure modes. And over the course of the next month, I did a lot of testing until I finally identified a new culprit. As it turned out, if you dropped the package 1.5 meters (4.5 feet), even securely housed in the conduit, the little glass

vial inside the Cyalume would break. If you got the angles right, the vial would break from as little as 1 meter (3 feet). Our conclusion was that there is no practical way to carry Cyalumes while guaranteeing they would not be exposed to a shock high enough to break the glass vial.

Our experience with Cyalumes got us thinking about backup lights in general. A backup light must be depended on when things are going wrong and must have the highest level of reliability so there is a high likelihood that it will work when needed. A backup light should also provide a nondestructive means to verify it will work when activated, allowing you to periodically test the backup light.

Cyalumes and other chemical lights fail both requirements for backup lighting: they do not possess the required level of reliability and they cannot be tested to verify they are still good. On the other hand, modern LED flashlights are available that are rugged, reliable and can be easily tested. And modern LED flashlights offer multiple brightness levels, so batteries can be conserved if an emergency forces a prolonged stay. And it is easy enough to lock-out the switch or isolate the battery to prevent accidental activation. Clearly, a modern LED flashlight is a superior backup light compared to Cyalumes and other chemical lights.

Cyalumes and other chemical lights are great for many uses - for instance, for marking objects and areas around an accident scene. Or marking out a helicopter landing zone. Or for marking tent stakes and guy wires around camp. Or for marking participants on a team. Or as party favors. However, they are not a good pick for backup lights.