

Army pyrotechnic experts find safer alternative for green fireworks

April 11 2011, by Bob Yirka



Image: Linus Gelber/Flickr

(PhysOrg.com) -- For years, the U.S. army and many other agencies around the world have been using hand-held green light-emitting signal flares; flares which are very nearly indispensable under certain adverse conditions. The problem is, the flares contain barium, a toxic metal that can build up quickly on training grounds. Barium is also the ingredient used in fireworks to make them glow green, which creates a problem for places such as Disneyworld that shoot off fireworks every night.

Enter Jesse Sabatini and his colleagues at Picatinny Arsenal in New

Jersey; they were tasked by the U.S. army with finding an alternative to barium that would work just as well but wouldn't cost any more. After working first with the powdery form of the pure element boron, which they knew when burned would produce boron oxide and in the process green light, they began investigating other boric substances because of the high cost and tendency of the pure stuff to burn too quickly.

Eventually, after some research they hit upon the idea of using [boron carbide](#) a ceramic already widely used as a plating material due to its extreme hardness. They found that it could be burned in its pure state and would produce green light just as well as barium and at nearly the same cost and have published their findings in *Angewandte Chemie International Edition*.

The team's findings come as a bit of a surprise to many in the chemistry field due to the fact that boron carbide has traditionally been considered highly inert (not chemically active).

In addition to eliminating the toxicity problem of using barium in flares, switching to boron carbide would also help reduce the dispersal of polychlorinated biphenyls since the current flares also contain a polyvinyl chloride (PVC) component, a very well known toxic agent that has been in the news as a pollutant for decades.

The U.S. army, which uses flares as both a means of illumination and to simulate battlefield explosions, stands to benefit dramatically by this new finding as it now spends a significant amount of money just cleaning up the toxic leftovers of its current flares.

It also seems likely based on the results of this new research that boron carbide will also soon replace [barium](#) in [fireworks](#) as well, making resorts all over the world safer places to visit.

More information: Boron Carbide as a Barium-Free Green Light Emitter and Burn-Rate Modifier in Pyrotechnics, *Angewandte Chemie*

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