



U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, D.C. 20590

JUN 06 2016

Mr. Douglas A. Knight
Principal Engineer
Intelligent Energy
505 Odyssey Way
Merritt Island, FL 32953

Reference No. 15-0219

Dear Mr. Knight:

This letter is in response to your November 5, 2015, letter requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to fuel cells. Specifically, you state that you have a small fuel cell with an attached solid fuel that is comprised of lithium aluminum hydride mixed with metal chloride (dangerous when wet and corrosive inorganic solid) totaling 15.0 grams and a lanthanum nickel aluminum alloy weighing 10.0 grams. You add that the fuel cell engine is not operational until it is connected to the operating system and then primed with oxygen. You ask if the fuel cell can be shipped as "UN 3166, Fuel Cell Engines" under the International Air Transport Association (IATA) Dangerous Goods Regulations (DGR) and/or if you can ship the whole assembly on the basis of the fuel itself under the HMR.

As specified in § 173.22 of the HMR, it is the shipper's responsibility to properly classify and package a hazardous material. This Office does not normally perform this function. However, the HMR authorize and provide conditions for use of international standards and regulations in § 171.22. As the IATA DGR is not included among those authorized, we cannot address your specific concerns, but based on the information that you provided in your letter—in conjunction with the International Civil Aviation Organization Technical Instructions for the Safe Transport of Dangerous Goods by Air and the International Maritime Dangerous Goods Code—it is the opinion of this Office that the material would best be described as "UN 3476, Fuel cell cartridges, *containing water reactive substances.*"

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

T. Glenn Foster
Chief, Regulatory Review and Reinvention
Standards and Rulemaking Division

Goodall, Shante CTR (PHMSA)

Andrews
173.10
Shipping Requirements
15-0219

From: Geller, Shelby CTR (PHMSA)
Sent: Thursday, November 05, 2015 3:17 PM
To: Hazmat Interps
Subject: FW: Request for letter of interpretation on shipment of fuel cell with installed chemical hydride fuel

Dear Shante and Alice,

Below is a request for a formal letter of interpretation.

Thanks,
Shelby

From: Knight, Douglas [<mailto:Douglas.Knight@intelligent-energy.com>]
Sent: Thursday, November 05, 2015 2:28 PM
To: PHMSA HM InfoCenter
Subject: Request for letter of interpretation on shipment of fuel cell with installed chemical hydride fuel

To Whom it May Concern

I am in need of a letter of interpretation in regards to our intent to ship a small fuel cell prototype that contains a chemical hydride fuel.

I have been looking into this in the IATA manual and it seems to not cover what we have completely (or clearly), probably because we are developing something not seen too much on the market.

We have a small fuel cell, about the size of an Iphone 6, that will have a solid fuel attached (the solid chemical hydride will emit hydrogen on demand). The solid fuel is of two components of

1. lithium aluminum hydride mixed with a metal chloride (dangerous when wet and corrosive inorganic solid), total weight 15.0 grams
2. lanthanum nickel aluminum alloy (absorbs and desorbs hydrogen). Total weight 10.0 grams

We plan to ship this prototype to Vegas for a showing in January. The entire assembly needs to be shipped as one unit being assembled in our laboratory here in Merritt Island, Florida.

I see there is a section in the IATA manual on fuel cell engines (UN 3166) but I am thinking the packing instructions (PI 950) is telling me the fuel tank has to be empty. Essentially this is the case since the hydrogen is trapped in the solid until we connect the power leads of fuel cell to the device it will power. The actual operation of the fuel cell is not possible until it is connected to a load and then purged with hydrogen (as to prime the fuel cell). The fuel does not emit hydrogen until the waste water from the "operating fuel cell" comes in contact with the fuel and the fuel cell will not operate until the fuel cell is connected to the operating system and then primed with hydrogen. The operating system (computer and other electrical devices) will not be shipped in the same package. We have to have this "solid fuel" installed in our lab prior to shipment since the fuel needs to be loaded under controlled conditions.

Alternatively, we could simply ship the whole assembly on the basis of the fuel itself. The lanthanum nickel aluminum alloy is not regulated, as seen in a SDS from Aldrich while the other fuel component (Lithium aluminum hydride/metal chloride) would be listed as (UN 3131) Water Reactive Solid, corrosive N.O.S..

In either case, I would secure the fuel cell assembly in a vacuum sealed bag, further seal a collection of these fuel cell assemblies into a bag and then into the appropriate can with a locked ring top, then into a DOT-SP 9168 packaging that is marked for cargo shipping only.

I have contacted Fedex and they instructed me to request a letter of Interp from your office and obtain the proper way to ship this item.

Your prompt response in this matter is greatly appreciated.

Regards

Douglas A. Knight Ph.D.
Principal Engineer - Fuel Chemistry



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