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Berylliant

Beryllium
9.01218

Evaluation of Pre-wetted Packaged Wipes for Analyzing Beryllium by Optical Fluorescence

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March 17, 2010

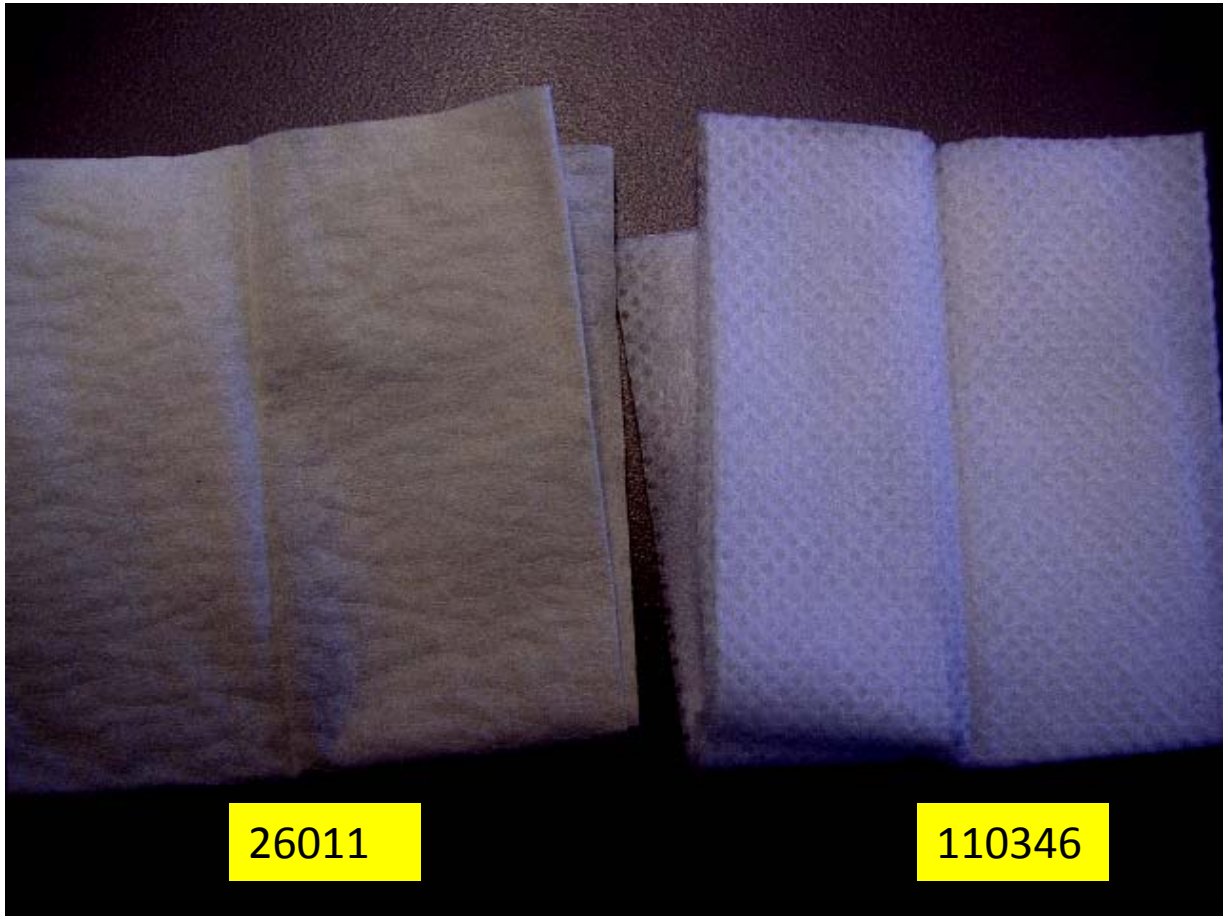
Purpose of the study

- Could the currently available pre-wetted wipes be used by fluorescence method?
- The current pre-wetted wipes meet standards developed for lead (e.g. ASTM E1792), would it be desirable to have a wipe standard developed for beryllium?

Types of Wipes Evaluated

Wipe Type	Production date or Lot #	Comments
Palintest Dust Wipe	26011 and 110346	Moistened wipe. Conforms to ASTM E 1792**.** Contains deionized water with benzalkonium chloride. Available from PalinTest USA, Erlanger, Kentucky.
Ghost Wipe	October 29th, 2008	Moistened wipe. Conforms to ASTM E 1792 Available from Environmental Express, Mt. Pleasant, South Carolina.
Lead Wipe	07/2009 #0913738	Moistened wipe. Conforms to ASTM E 1792. Contains water, polyorbate 20,methylparaben, propylparaben. Available from Lynx Products, Thorofare, NJ
Whatman 541		Not Moistened. Hardened ashless circles 47mm diameter. Available from Lab supply companies-Fisher Scientific, VWR, etc.

Differences Between Two Batches of Palintest Wipes



Water Content and Size of Wipes

Wipe Type	Average water content (ml) (n=4)	Standard deviation (n=4)	Size cm X cm (Sq cm)
Ghost Wipe	3.54	0.01	15X14 (208)
Lead Wipe	1.84	0.05	20X13 (250)
Palintest Lot # 26011	1.80	0.04	18X13 (226)
Palintest Lot # 110346	1.98	0.01	18X13 (226)
Whatman 541	0.0	0.0	4.7 Dia (17)

For lead testing: Typical wipe area for reporting results: 900 sq cm (1 square foot)
For beryllium testing: Typical wipe area for reporting results: 100 sq cm

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Procedure

1. 1% Aqueous ammonium bifluoride (ABF) with or without activated carbon# (20ml*)+ wipe+ beryllium (as beryllium acetate)
2. Heat treat at 85C for one hour, cool.
3. Remove 0.04ml of the ABF solution and add 1.6ml of HBQS dye solution (5X dilution)*.
4. Measure fluorescence – Excitation at 365nm and emission at 480±5nm.

Activated carbon is given a proprietary treatment at Berylliant

* Since 20ml of dissolution solution was used/wipe to accommodate larger wipe size), higher sensitivity protocol of 5X had to be used to provide the required sensitivity (standard procedure calls for 5ml of dissolution solution and 20X dilution).

Blank and Background Results

Wipe Type	Average Beryllium µg (n=4)	Std. Deviation (n=4)
Blank	-0.006	0.001
Ghost Wipe	-0.002	0.001
Lead Dust Wipe	0.013	0.001
Palintest Wipe, Lot# 26011	0.007	0.000
Palintest Wipe, Lot# 110346	0.059	0.001
Whatman Filter 541	-0.004	0.001

Reduction of Background by Adding Activated Carbon Black

Wipe Type	Average Beryllium µg (n=4) (w/o carbon black)	Std. Deviation (n=4)
Blank	-0.003 (-0.005)	0.001
Ghost Wipe	-0.003 (-0.002)	0.000
Lead Dust Wipe	-0.004 (0.015)	0.001
Palintest Wipe, Lot# 26011	-0.004 (0.007)	0.001
Palintest Wipe, Lot# 110346	-0.003 (0.059)	0.001
Whatman Filter 541	-0.004 (-0.004)	0.001

Activated carbon used was in a quantity of 10mg/ml of dissolution solution

Results of added beryllium, 0.2µg

Wipe Type	Measured Beryllium, µg			
	w/o carbon	w/ carbon	w/carbon corrected for water content	% Change after correcting for water
Ghost Wipe	0.190	0.186	0.219	18
Lead Dust Wipe	0.2	0.175	0.191	9
Palintest Wipe, Lot# 26011	0.182	0.192	0.209	9
Palintest Wipe, Lot# 110346	0.223	0.170	0.187	10
Whatman Filter 541	2.14	2.16	N/A	N/A

Results of Added Beryllium, 0.8µg

Wipe Type	Measured Beryllium, µg			
	w/o carbon	w/ carbon	w/carbon corrected for water content	% Change after correcting for water
Ghost Wipe	0.735	0.738	0.868	18
Lead Dust Wipe	0.748	0.727	0.794	9
Palintest Wipe, Lot# 26011	0.698	0.760	0.828	9
Palintest Wipe, Lot# 110346	0.722	0.691	0.760	10
Whatman Filter 541	0.833	0.802	N/A	N/A

Conclusions

- The pre-wetted wipes currently available can be used for beryllium analysis.
  - The most preferred are Ghost wipes
  - Each batch of wipes must be checked for background, and if necessary activated carbon black treatment may be used.
  - The water content in these wipes could lead to significant errors.
- A standard for pre-wetted wipes for beryllium analysis is highly desired.
  - Since these wipes will have no beryllium background, extra testing or use of additives to reduce background will not be necessary.
  - Smaller wipes will allow beryllium to be tested with higher sensitivity and decrease chemical waste.
  - Water content in the wipes should be reduced and controlled more tightly in order to reduce or eliminate the need for correction. Smaller wipes will also reduce the severity of this issue.