

An Introspective Look at Eichrom QC Developments

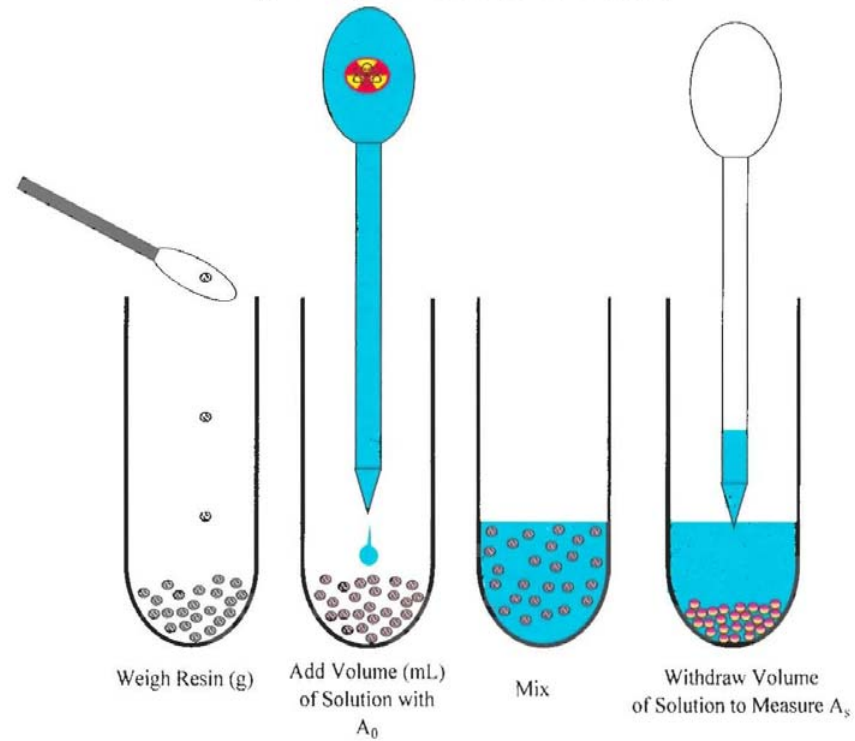
Joel Williamson, Jill Bryant, Steffen Happel,
Dan McAlister, Anil Thakkar and Phil Horwitz

Eichrom Technologies, Inc.

Update on New QC Protocols

- TRU and TEVA resins completed
- UTEVA and Sr resin testing completed, specifications to be set
- DGA Normal and Anion resins next

Dry Weight Distribution Ratio



$$D_w = \frac{A_0 - A_s}{w(g)} \bigg/ \frac{A_s}{v(\text{mL})}$$

New QC Protocols

Advantages of new QC Protocols:

- A better screen to ensure consistent and reliable products
 - Product tested in format most likely used by laboratory
 - Chromatographic performance verified
 - Introduces decontamination factors as a QC performance criterion
 - Enhances laboratory confidence on Eichrom products
- Enhances the ability of quality and operations to work more closely together.

In late 2005, the need arose for Eichrom to find a new supplier for the extractant used to make UTEVA resin, Dipentyl-pentane phosphonate (DPPP or DAAP).

Past Eichrom Testing Results

DAAP Supply	Dw
Previous supply #UTS03175	193
New supply #UTS05026	354

Warning Signs

DAAP supply	Dw	Th in Th fraction	Th in U fraction
Previous supply #UTS03175	193	109%	0.13%
New supply #UTS05026	354	81%	5.2%

Not acceptable, manufacturing
evaluating options

New Sr QC Protocol

- 1) Precondition with 5 mL of 8M HNO₃
- 2) 15 mL Load solution of 5 mg Sr, Y and Ba, and 50 mg Ca in 8M HNO₃
- 3) Rinse with 5 mL 8M HNO₃
- 4) Rinse with 5 mL 3M HNO₃/0.05M oxalic acid
- 5) Rinse with 5 mL 8M HNO₃
- 6) Strip with 15 mL 0.05M HNO₃

Initial Testing of Historical A Grade Lots

SRA02256						
Solution	Matrix	%Ba	%Ca	%Sr	%Y	
1	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.10	0.01	80.86	0.00	
2	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.08	0.01	82.56	0.03	
3	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.08	0.02	86.06	0.02	
4	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.10	0.02	85.88	0.02	
5	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.08	0.02	84.44	0.02	

SRA03026						
Solution	Matrix	%Ba	%Ca	%Sr	%Y	
1	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.19	0.02	94.19	0.00	
2	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	1.80	0.89	93.87	0.02	
3	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.15	0.02	92.76	0.00	
4	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.37	0.05	93.17	0.00	
5	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	1.89	0.93	93.30	0.00	

SRA04076						
Solution	Matrix	%Ba	%Ca	%Sr	%Y	
1	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.16	0.02	91.59	0.09	
2	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.09	0.02	92.07	0.04	
3	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.07	0.02	88.63	0.05	
4	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.10	0.03	87.98	0.04	
5	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.08	0.03	89.01	0.04	

SRA04106						
Solution	Matrix	%Ba	%Ca	%Sr	%Y	
1	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.62	0.36	90.05	0.22	
2	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.12	0.03	91.63	0.05	
3	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.10	0.02	92.61	0.05	
4	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.79	0.58	91.39	0.47	
5	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.11	0.02	90.06	0.05	

Initial Testing of Historical S Grade Lots

SRS02225						
Solution	Matrix	%Ba	%Ca	%Sr	%Y	
1	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.03	0.01	84.31	0.01	
2	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.03	0.01	90.62	0.01	
3	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.03	0.01	89.54	0.01	
4	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.04	0.01	89.11	0.01	
5	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.04	0.01	88.55	0.01	

SRS03076						
Solution	Matrix	%Ba	%Ca	%Sr	%Y	
1	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.04	0.01	89.76	0.02	
2	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.04	0.01	93.93	0.02	
3	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.07	0.02	92.23	0.03	
4	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.04	0.01	93.14	0.02	
5	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.04	0.01	91.90	0.02	

SRS04264						
Solution	Matrix	%Ba	%Ca	%Sr	%Y	
1	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.06	0.01	89.81	0.06	
2	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.05	0.02	93.92	0.05	
3	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.07	0.02	89.53	0.06	
4	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.08	0.01	89.69	0.04	
5	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.05	0.01	93.36	0.04	

SRS05096						
Solution	Matrix	Ba	Ca	Sr	Y	
1	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.07	0.02	97.10	0.05	
2	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.06	0.02	98.14	0.05	
3	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.07	0.02	95.75	0.05	
4	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.06	0.02	98.28	0.04	
5	5 mg Sr + 5 mg Y + 5 mg Ba + 50 mg Ca	0.07	0.02	94.85	0.05	

A Grade Vs S Grade Summary

% Range	A Grade	S Grade
Sr	84.0 - 93.5	88.4 - 96.8
Ba	0.09 - 0.88	0.03 - 0.07
Y	0.00 - 0.17	0.01 - 0.05
Ca	0.02 - 0.38	0.01 - 0.02

Why is S Grade Better?

Results can be attributed to better chromatographic performance in S grade resins versus A grade resins due to smaller particle size

Conclusions

- New QC protocols allow Eichrom to better discover quality issues before products get in customer's hands
- New QC protocols also allow Eichrom to better work with our suppliers to ensure our products are meeting customer's needs
- Smaller particle size S grade resin yields improved chromatographic results over A grade