RSA™

REDUCED SURFACE ACTIVITY GLASS

White Paper

Effect of Diluent on Analyte Adsorption to Glass Vials

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It is well known that silanol groups present on the surface of Type I autosampler glass vials contribute to quantitative loss in the case of basic analytes. This is believed to occur primarily by electrostatic interaction and possibly by hydrogen bonding to some degree. In order to investigate the nature of this interaction in more detail, we conducted a series of experiments using different sample diluents.

The first type was plain DI water (pH ~5.5). In this case, the silanol groups should be ionized and would allow for electrostatic interactions to occur. The second type was the DI water with 0.1% formic acid. Under these conditions, the silanol groups would no longer be ionized so only hydrogen bonding would be possible. The third diluent was DI water with a buffer of 10mM ammonium acetate adjusted to pH 7.00. We chose these two additives because they are at different pH values, but also because they are commonly used in LC-MS analyses in both the diluent and the mobile phase (and therefore are of significance to the end-user).

The standard Type I glass vial was also compared against Reduced Surface Activity (RSA™) glass autosampler vials, which are virtually free of silanols due to the manufacturing process. 5ppm solutions of cationic test solutes (thiamine and cetylpyridinium chloride) were studied under these conditions.

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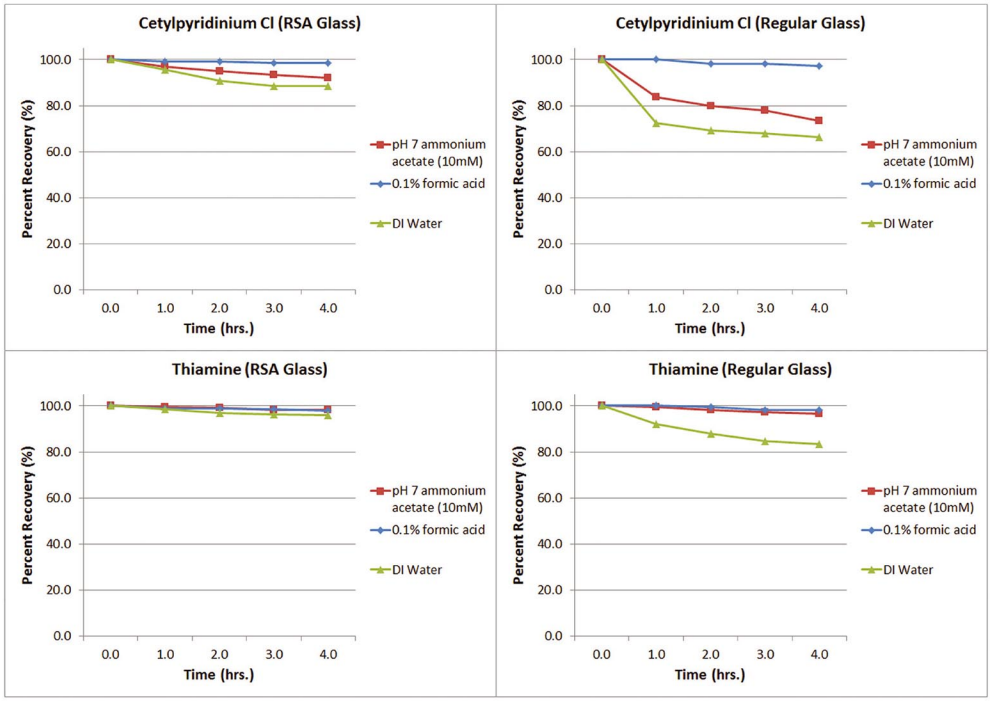
The data is summarized in the four tables. Cetylpyridinium chloride showed more significant loss than thiamine under otherwise identical conditions. Furthermore, percent recovery using RSA™ glass was notably higher than with conventional type I glass. The diluent had the most significant effect of the variables studied for keeping the recovery high. It was found that the percent recovery did not fall below 97.4% for any of the data obtained using a formic acid additive in the diluent. This suggests that electrostatic interactions play an important role in the adsorption with only minor contributions due to hydrogen bonding.

Given this data, it may be suspected that a pH 7 ammonium acetate buffer would produce even greater analyte loss than with plain DI water, since more of the silanols would be ionized at pH 7. However, this was not observed to be the case; in fact, the percent recovery was lower than with formic acid but greater than with plain DI water. It may be plausible that the ammonium ion is competing with the basic analyte for interaction with silanol sites. In that case, analyte loss would not be as siginificant as predicted.



We can see that the use of either additive reduces the effect of analyte loss to the glass. Together with RSA™ glass, this analyte loss can be reduced even further. Keeping these factors and their relative significance in mind can help the end-user plan their sample preparation strategies for optimization of analyte recovery.

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Don't risk your data due to poor reproducibility from the reactivity of your autosampler vials! Reactivity of your vials may initiate unwanted investigations, lost time and poor results. Use autosampler vials made with RSA™ Glass to insure you don't get frustrated.

INSERTS – AQ™ BRAND 100/PACK

9502S-02N-RS	Inserts, 6x29mm, 200ul, w/attached plastic springs.

VIALS – AQ™ BRAND 100/PACK

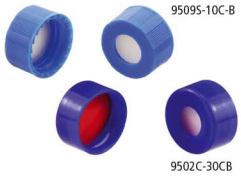
9509S-WCV-RS	2ml vials, clear 9mm screw top w/ write on patch.
9509S-WAV-RS	2ml vials, amber 9mm screw top w/ write on patch.
9512C-0CV-RS	1.5ml vials, clear, Max Recovery center draining snap top.
9512S-0CV-RS	1.5ml vials, clear, Max Recovery center draining 9mm screw tops.
9512C-0CV-T-RS	1.2ml, MRQ™ vials, clear, snap tops.
9512S-0CV-T-RS	1.2ml, MRQ™ vials 9mm, clear, screw tops.
9532C-0CV-RS	Vials w/ 300ul fused insert, clear, snap tops.
9532S-0CV-RS	Vials w/ 300ul fused insert, clear, 9mm screw tops.

SCREW CAPS – AQ™ BRAND

9509S-10C-B	Caps, light blue w/ fitted ultra pure silicone/PTFE septa. 100/pack
9509S-10C-B-M	Caps, light blue w/ fitted ultra pure silicone/PTFE septa. 1000/case
9509S-30C-B	Caps, light blue w/ preslit fitted ultra pure silicone/PTFE septa. 100/pack
9509S-30C-B-M	Caps, light blue w/ preslit fitted ultra pure silicone/PTFE septa. 1000/case

SNAP CAPS – MICROSOLV BRAND

9502C-10CB	Caps, blue w/ silicone/PTFE septa. 100/pack.
9502C-10CB-M	Caps, blue w/ silicone/PTFE septa. 1000/case.
9502C-30CB	Caps, blue w/ preslit silicone/PTFE septa. 100/pack.
9502C-30CB-M	Caps, blue w/ preslit silicone/PTFE septa. 1000/case.



EASY PURCHASE PACKS – AQ™ BRAND 100/PACK

9509S-1WAP-RS	2ml amber write on vials and light blue AQR screw caps w/ silicone/PTFE septa.
9509S-1WCP-RS	2ml clear write on vials and light blue AQR screw caps w/ silicone/PTFE septa.
9509S-3WAP-RS	2ml amber write on vials and light blue AQR screw caps w/ preslit silicone/PTFE septa.
9509S-3WCP-RS	2ml clear write on vials and light blue AQR screw caps w/ preslit silicone/PTFE septa.
9512C-1MP-RS	1.2ml clear MRQ™ vials and blue snap caps w/ silicone/PTFE septa.
9512C-3MP-RS	1.2ml clear MRQ™ vials and blue snap caps w/ preslit silicone/PTFE septa.
9532S-1CP-RS	300ul fused insert vials and light blue AQR screw caps w/ silicone/PTFE septa.
9532S-3CP-RS	300ul fused insert vials and light blue AQR screw caps w/ preslit silicone/PTFE septa.
9512S-1CP-RS	1.5ml Max Recovery Vials, clear and light blue AQR screw caps w/ silicone/PTFE septa.
9512S-3CP-RS	1.5ml Max Recovery Vials, clear and light blue AQR screw caps w/ preslit silicone/PTFE septa.
9512S-1MP-RS	1.2ml MRQ™ Vials, clear and light blue AQR screw caps w/ silicone/PTFE septa.
9512S-3MP-RS	1.2ml MRQ™ Vials, clear and light blue AQR screw caps w/ preslit silicone/PTFE septa.

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