

Volume Accuracy and Repeatability using the Vision® G2 AutoPlus™ System with Surfactant Dissolution Media

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Introduction

The Vision G2 AutoPlus System was a very important addition to Teledyne Hanson's line of dissolution testers. Vision AutoPlus autosamplers allow users to collect samples automatically from a dissolution system during a test at predefined time intervals plus the addition of stabilizers and dilutions. Precise and consistent sample collection is required; therefore, replacing dissolution medium with fresh media is very important to obtain accurate test data. With recent advancements in technology and increased regulatory requirements in mind, Teledyne Hanson offers an upgrade from standard 5 mL syringes to 10 mL syringes. This upgrade was perfected in our engineering and analytical laboratory through a process of rigorous testing and evaluation to drive added value to our customers. The accuracy of the volume collected during an autosampling procedure while a surfactant was used in the dissolution medium was evaluated with the 10 mL syringes.



The Vision G2 AutoPlus system

Background

Surfactants are commonly used in dissolution medium preparation. They are wetting agents that increase the solubility of poorly soluble drugs; however, the use of surfactants creates challenges, specifically with an autosampler. There are several types of surfactants; these can be negatively charged, positively charged, or neutral. Examples of surfactants are sodium lauryl sulfate (SLS), Tween, Triton X, bile salt and cetyltrimethyl ammonium bromide (CTAB). The most commonly used of these is SLS, but it has its own challenges in use. Degassing of dissolution media with surfactants is very difficult, as well as pointless, due to its tendency to reaerate quickly. If deaeration is needed, degas purified water first before dissolving the surfactant. The use of dissolution media with surfactants leads to challenges with most autosamplers, but the Vision AutoPlus can be used with surfactants, as shown by the data below.

Experiment

In this experiment, sodium lauryl sulfate in concentrations ranging from 0.5% to 10% were dissolved in purified water. Each concentration of dissolution media was filled into 6 vessels of a dissolution tester. A Vision G2 AutoPlus system was used to collect 10 mL of dissolution medium at 10-, 20-, and 30-minute intervals of a short test. The dispensed dissolution medium was collected in a clean, dry, and pre-weighed test tube. The collected solution was weighed in the tared test tube after it reached room temperature. The volume of collected solution was calculated by dividing with experimental density of the solution used. Each experiment was performed in duplicate for accurate measurement. The density was measured in triplicate by the weighing of 10 mL solution, accurately dispensed into a clean and dry beaker.

10 mL	0.50%	2.50%	5.0%	7.50%	10%
1	10.001	10.003	10.02638	10.04459	10.07798
2	10.002	10.004	10.00923	10.04059	10.06608
3	10.001	10.008	10.00726	10.04599	10.06297
Average	10.00133	10.005	10.01429	10.04372	10.06901
Density	1.000133	1.0005	1.001429	1.004372	1.006901

Table 1 – Density of sodium lauryl sulfate solution, measured in laboratory

Time Minutes	Vessel	Empty Test Tube (g)	Filled Test Tube (g)	Sample Weight (g)	Sample Volume (mL)	% Difference
10	1	7.67	17.66	9.99	9.985	-0.05
	2	7.57	17.56	9.99	9.985	-0.05
	3	7.74	17.67	9.93	9.925	-0.05
	4	7.65	17.57	9.92	9.915	-0.05
	5	7.39	17.33	9.94	9.935	-0.05
	6	7.59	17.51	9.92	9.915	-0.05
20	1	7.68	17.65	9.97	9.965	-0.05
	2	7.67	17.62	9.95	9.945	-0.05
	3	7.66	17.65	9.99	9.985	-0.05
	4	7.61	17.59	9.98	9.975	-0.05
	5	7.60	17.54	9.94	9.935	-0.05
	6	7.69	17.69	10.00	9.995	-0.05
30	1	7.64	17.63	9.99	9.985	-0.05
	2	7.64	17.63	9.99	9.985	-0.05
	3	7.64	17.63	9.99	9.985	-0.05
	4	7.64	17.63	9.99	9.985	-0.05
	5	7.73	17.73	10.00	9.995	-0.05
	6	7.72	17.72	10.00	9.995	-0.05

Table 2 – Volume accuracy measurement using 2.5% sodium lauryl sulfate solution

Time Minutes	Vessel	Empty Test Tube (g)	Filled Test Tube (g)	Sample Weight (g)	Sample Volume (mL)	% Difference
10	1	7.66	17.70	10.04	10.00	-0.44
	2	7.70	17.74	10.04	10.00	-0.44
	3	7.68	17.73	10.05	10.01	-0.44
	4	7.64	17.68	10.04	10.00	-0.44
	5	7.68	17.73	10.05	10.01	-0.44
	6	7.68	17.71	10.03	9.99	-0.44
20	1	7.68	17.75	10.07	10.03	-0.44
	2	7.77	17.83	10.06	10.02	-0.44
	3	7.73	17.78	10.05	10.01	-0.44
	4	7.57	17.62	10.05	10.01	-0.44
	5	7.73	17.78	10.05	10.01	-0.44
	6	7.73	17.80	10.07	10.03	-0.44
30	1	7.72	17.75	10.03	9.99	-0.44
	2	7.64	17.68	10.04	10.00	-0.44
	3	7.65	17.69	10.04	10.00	-0.44
	4	7.71	17.75	10.04	10.00	-0.44
	5	7.64	17.68	10.04	10.00	-0.44
	6	7.68	17.71	10.03	9.99	-0.44

Table 4 – Volume accuracy measurement using 7.5% sodium lauryl sulfate solution

Time Minutes	Vessel	Empty Test Tube (g)	Filled Test Tube (g)	Sample Weight (g)	Sample Volume (mL)	% Difference
10	1	7.65	17.65	10.00	9.99	-0.14
	2	7.71	17.71	10.00	9.99	-0.14
	3	7.66	17.68	10.02	10.01	-0.14
	4	7.68	17.68	10.00	9.99	-0.14
	5	7.70	17.67	9.97	9.96	-0.14
	6	7.68	17.65	9.97	9.96	-0.14
20	1	7.78	17.78	10.00	9.99	-0.14
	2	7.74	17.73	9.99	9.98	-0.14
	3	7.64	17.63	9.99	9.98	-0.14
	4	7.58	17.58	10.00	9.99	-0.14
	5	7.74	17.74	10.00	9.99	-0.14
	6	7.70	17.70	10.00	9.99	-0.14
30	1	7.71	17.71	10.00	9.99	-0.14
	2	7.63	17.63	10.00	9.99	-0.14
	3	7.64	17.61	9.97	9.96	-0.14
	4	7.71	17.70	9.99	9.98	-0.14
	5	7.63	17.65	10.02	10.01	-0.14
	6	7.66	17.65	9.99	9.98	-0.14

Table 3 – Volume accuracy measurement using 5.0% sodium lauryl sulfate solution

Time Minutes	Vessel	Empty Test Tube (g)	Filled Test Tube (g)	Sample Weight (g)	Sample Volume (mL)	% Difference
10	1	7.65	17.72	10.07	10.00	-0.69
	2	7.58	17.63	10.05	9.98	-0.69
	3	7.76	17.80	10.04	9.97	-0.69
	4	7.67	17.73	10.06	9.99	-0.69
	5	7.38	17.42	10.04	9.97	-0.69
	6	7.60	17.65	10.05	9.98	-0.69
20	1	7.67	17.73	10.06	9.99	-0.69
	2	7.65	17.73	10.08	10.01	-0.69
	3	7.65	17.71	10.06	9.99	-0.69
	4	7.61	17.67	10.06	9.99	-0.69
	5	7.60	17.66	10.06	9.99	-0.69
	6	7.70	17.74	10.04	9.97	-0.69
30	1	7.64	17.70	10.06	9.99	-0.69
	2	7.64	17.70	10.06	9.99	-0.69
	3	7.63	17.71	10.08	10.01	-0.69
	4	7.64	17.70	10.06	9.99	-0.69
	5	7.72	17.78	10.06	9.99	-0.69
	6	7.71	17.76	10.05	9.98	-0.69

Table 5 – Volume accuracy measurement using 10.0 % sodium lauryl sulfate solution

Time in Minutes	Concentration of Sodium Lauryl Sulfate Solution				
	0.50%	2.50%	5.00%	7.50%	10.00%
	% Difference in Volume Accuracy from 10 mL Set Value				
10	-0.01%	-0.05%	-0.14%	-0.44%	-0.69%
20	-0.01%	-0.05%	-0.14%	-0.44%	-0.69%
30	-0.01%	-0.05%	-0.14%	-0.44%	-0.69%
Average	-0.01%	-0.05%	-0.14%	-0.44%	-0.69%

Table 6 – Summary of all results



A Vision G2 Elite 8 Dissolution System with an AutoPlus Autosampler

Conclusion

Based on the results tables above, it is concluded that the Hanson AutoPlus Autosampler is capable of handling dissolution media with surfactant concentration of up to 10% with a volumetric accuracy better than 1%. Even though such a high concentration of surfactant would not be used in laboratory, the test was conducted with such concentrations to examine the capacity of the autosampler.

After the use of a surfactant at any concentration, the autosampler must be rinsed multiple times with purified water. Hot water of about 50 °C will enhance the cleaning procedure. Surfactant generates foam when the solution is disturbed by any means; this generated foam, if not rinsed well, will introduce inaccurate volume displacement. Teledyne Hanson's AutoPlus system provides an auto-wash feature to rinse the sampling assembly and associated tubing at the end of the test.

Avoid the long-term use of surfactant at concentrations greater than 1.5% to prevent damage to mechanical components. Should such concentrations be required, consult Teledyne Hanson's technical support department in advance.

About Teledyne Hanson

Teledyne Hanson is a global technology company specializing in test instruments for the pharmaceutical industry. Founded by the innovator of modern dissolution test technology, Teledyne Hanson helps ensure that the world's pharmaceuticals are pure, safe, and effective by manufacturing equipment that sets the global standard for quality, innovation, and long-term value. Teledyne Hanson instruments are used by scientists in over 75 countries worldwide and are supported by the industry's top customer service team. For more information, please visit teledynehanson.com.

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