Toxicological Assessment of ISS Air Quality: September 2012 – October 2012 with Formaldehyde Supplement from May-October 2012

A summary of the analytical results from 6 grab sample containers (GSCs) and 12 pairs of formaldehyde badges collected on ISS and returned aboard 29S or 31S is shown in Table 1. The average recoveries of the 3 surrogate standards from the GSCs were as follows: ^{13}C-acetone, 128%; fluorobenzene, 114%; and chlorobenzene, 78%. Recoveries of two lab-control formaldehyde badges averaged 95%.

Table 1. Analytical Summary of ISS results

Sample Location	Sample Date	NMVOCs[a] (mg/m^3)	Freon 218 (mg/m^3)	CO_2 (mg/m^3)	Alcohols (mg/m^3)	T Value[b] (units)	Formaldehyde (µg/m^3)
Lab	4/25/12	--	--	--	--	--	34
SM	4/25/12	--	--	--	--	--	19
Lab	6/30/12	--	--	--	--	--	43
SM	6/30/12	--	--	--	--	--	20
Lab	7/18/12	--	--	--	--	--	37
SM	7/18/12	--	--	--	--	--	24
Lab	8/22/12	--	--	--	--	--	31
SM	8/22/12	--	--	--	--	--	29
Lab	9/15/12	10	22	5200	5.9	0.55	29
SM	9/15/12	8	19	7300	5.5	0.42	32
JPM	9/15/12	9	22	5900	5.4	0.44	--
Lab	10/22/12	9	23	4300	6.9	0.35	31
SM	10/22/12	11	23	4300	8.5	0.36	23
Columbus	10/22/12	10	19	5100	6.7	0.42	--
Guideline		*<25*	---	*<9300*	*<5*	*<1*	*<120*

[a] Non-methane volatile organic hydrocarbons, excluding Freon 218
[b] Based on 180-d SMACs and calculated excluding CO_2

Toxicological Evaluation of ISS Air Quality: Despite the limited number of samples, the "snap shots" compiled in the table above reflect a stable period in which the air easily meets requirements for human respiration. Formaldehyde concentrations, except for the pair taken on 8/22/12, continue to show less formaldehyde in the SM than in the Lab; however, all concentrations are far below the spacecraft maximum allowable concentration of 120 µg/m^3. The uniformity of Freon 218 concentrations show relatively uniform mixing of this compound, with low concentrations suggesting that no leak has occurred for some time. Alcohol concentrations slightly exceed the target value of 5 mg/m selected to minimize alcohols in the water recovery system.

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Enclosures Table 1: Analytical concentrations of compounds found in the 31S GSCs
Table 2: T-values corresponding to analytical concentrations in Table 1.