

Soyuz 8 Return Samples: Assessment of Air Quality Aboard the International Space Station

The toxicological assessments of 11 dual sorbent tubes (DSTs) and 24 formaldehyde badges returned aboard Soyuz 8 are reported. The recovery of surrogates from one DST was too low. Analytical methods have not changed from earlier reports. The recoveries of the less volatile surrogates from the DSTs averaged 91 and 102 %; however, ¹³C-acetone was only recovered at an average of 53 %. Correction factors were applied to volatile polar compounds. Formaldehyde recoveries from 3 positive controls were 85, 88 and 97%.

The two general criteria used to assess air quality are the total-non-methane-volatile organic hydrocarbons (NMVOCs) and the total T-value (minus the CO₂ and formaldehyde contributions). Control of atmospheric alcohols is important to the water recovery system engineers, hence total alcohols (including acetone) are also shown for each sample. Because formaldehyde is quantified from sorbent badges, its concentration is also listed separately. These four indices of air quality are summarized below:

<u>Sample & Location</u>	<u>Date</u>	<u>NMVOCs</u> (mg/m ³)	<u>T Value^a</u> (units)	<u>Alcohols</u> (mg/m ³)	<u>Formaldehyde</u> (µg/m ³)
Lab/DST/For.	6/11/04	4	0.24	2	32
SM/DST/For.	6/11/04	7	0.37	5	26
Lab/DST/For.	6/28/04	8	0.81	6	34
SM/DST/For.	6/28/04	8	0.45	6	21
Lab/DST/For.	7/27/04	8	0.44	6	40
SM/DST/For.	7/27/04	8	0.42	6	29
Lab/DST/For.	8/13/04	9	0.52	7	49
SM/For.	8/13/04	pr ^b	pr	pr	33
Lab/DST/For.	9/9/04	11	0.90	9	33
SM/DST/For.	9/9/04	13	1.02	10	35
Lab/DST/For.	10/14/04	10	0.50	8	26
SM/DST/For.	10/14/04	10	0.40	8	26
<i>Acceptable Guideline:</i>		<25	<1	<5	50

^a Formaldehyde and CO₂ not included in T calculation.

^b pr = poor recovery of surrogate standards

All formaldehyde concentrations were within the long-term SMAC. The Lab samples continue to show somewhat higher values than the SM samples except near the end of the sampling period. The T values and NMVOCs are essentially within acceptable guidelines; however, the total alcohol levels often exceed the guideline of 5 mg/m³ set to protect the water recovery system. Although the air samples are sparse, there are no indications that air quality has degraded aboard the ISS.

Enclosures

Table 1: [Analytical Concentrations of DST Samples](#)

Table 2: [T-Value Calculations of DST Samples](#)