

Lab 8

Atomic Oxygen Worksheet

1. How much mass did each sample lose? How does this compare to the accuracy and repeatability of the scale?

Sample 1 had an average of 0.002 grams increase after exposure to AO. The standard deviation of the mass measurements was 1968.5% of this change. Sample 2 decreased by 0.014 grams after exposure to AO and the standard deviation of mass measurements was 133.6% of the measurement. Sample 3 increased by 0.028 grams with a standard deviation 40.7% of the measurement. Sample 4 decreased by 0.020 grams with a standard deviation 97.5% of the measurement. The standard deviation is a representation of the accuracy and repeatability of the measurements. The standard deviation being larger than the measurement means we don't really know with much confidence whether it increased or decreased. The average change in mass was a loss of a single milligram. The standard deviation was 21 times this.

2. What were the flux and fluence values of each sample? Are the values within the expected provided ranges?

	Sample 1	Sample 2	Sample 3	Sample 4
Fluence (particle/cm ²)	-9.8*10 ¹⁹	6.86*10 ²⁰	-1.37*10 ²¹	9.8*10 ²⁰
Flux (particles/(s*cm ²))	-1.82*10 ¹⁶	1.27*10 ¹⁷	-2.45*10 ¹⁷	1.82*10 ¹⁷

No because some of these flux and fluence values are negative when they should all be positive.

3. Describe the qualitative effects the AO had on the samples. What qualitative observations can you make about spectral reflectance and surface texture?

The texture is more matte than smooth and the surface is less reflective

4. Discuss other sources that can contribute to the mass loss of the samples. Is it possible to make a change to the system that would eliminate one of these sources? If so, which source and what change(s) would you suggest?

Mass loss can also come from outgassing and from the collisions of other neutral atoms. A chamber with just AO would eliminate the other neutral molecules as a cause. The material could be put in a vacuum chamber first so that the initial high levels of outgassing are accomplished before taking the mass.

5. What is one way that AO can be used on purpose to produce a desired effect? (does not have to be Aerospace related).

Create a matte surface finish. This is desirable when trying to limit reflectance

6. What are some design tactics to use if you must have a material that has a high erosion rate due to AO on a LEO spacecraft?

Use a thicker layer of the material so it still is present once eroded.