TEGA: Where we are and where we would like to go

Bill Boynton

October 9, 2008

- **4 samples analyzed fully**
  - **TA4, Baby Bear: Disturbed surface sample taken soon after landing**
  - **TA0, Wicked Witch: sublimation lag from bottom of Snow White trench. It had a small amount of ice with it (~1% or less)**
  - **TA5, Rosy Red: A well documented undisturbed surface sample**
  - **TA7, Burn Alive: A deep sample taken beneath Rosy Red to look for differences as a function of depth.**
- **TA1, A "blank" sample: It has just been analyzed, and some data arrived an hour ago. It is in lieu of the OFB, for which we had a failed delivery due to wind blowing the sample off target.**

Interesting observations on carbonate(s)

- **All samples show release of CO2 at low temperature (250 C to 600C)**
  - **This low-temperature CO2 could be from FeCO3, oxidized Mars organics, or oxidized terrestrial organics.**
    - **Today's data on TA1 looks like we can eliminate the last of these.**
  - **The amount is low, on the order of 0.0x% carbonate (based on CO2 volume)**
- **All samples show release of CO2 at high T (700 C to 1000 C)**
  - **This CO2 is almost certainly due to CaCO3.**
  - **Two samples (Baby Bear and Wicked Witch) showed a small amount of high-T release of CO2**
    - **On the order of 0.0x % carbonate**
  - **Rosy Red had much more CaCO3 (on the order of 5%)**
  - **Burn Alive has some intermediate amount of CaCO3, but it is too soon to know for sure how much.**

CO2 Isotope Ratios

- **We have a new way to analyze the released gases now that we understand the nature of their release pattern.**
  - **We collect all of the gases in a certain temperature range and release them for analysis all at once.**
  - **We record the pressure of the gases released as a function of time to know the temperatures of release.**
  - **The total pressure is a good measure of the amount of gas released.**
  - **This approach allows us to have a much higher signal-to-noise ratio for the isotopes of CO2.**

Precision of isotope ratios

- **We have been able to demonstrate excellent precision on our measurement of count-rate ratios**
  - **Conversion to isotope ratios depends on getting high precision on our calibration gas, but we expect that to not be a problem.**
  - **Other sources of systematic error must also be evaluated**
  - **For Burn Alive, we got good data on both the low-T and high-T CO3 release.**
    - **For mass 45 we get ± 1.5 ‰ (requirement is 5 ‰)**
    - **For mass 46 we get ± 1.4 ‰ (requirement is 10 ‰)**
  - **Isotopic ratios could help argue for low-T CO2 being from Mars organics rather than carbonates.**

Where we go from here?

- We have three ovens available.
  - Two have doors only partially open (tented) TAs 2 and 6.
    - TA6 is slated to get Rosy Red this weekend
  - The third one still has closed doors.
    - We can have confidence at least one door will open fully.
- Desired samples?
  - Rosy Red (a re-do of what was done before, originally because we had a plugged porous frit on the oven outlet that sealed the gas in the oven until it spontaneously unplugged.)
  - Another dry sample like Wicked Witch or Sorceress (dry sublimation lag)
    - This sample is to confirm that it had much less carbonate and to see if there is any difference in isotopic ratios of carbonate
  - An icy sample from wherever it is felt we have the best chance of getting a good delivery
    - This is mainly to get the D/H ratio of the ice.