Current Laboratory Research and Venus In-Situ Chamber Investigations

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Background

- Relatively few missions to Venus, even fewer landers
- Workability/survivability of instruments and equipment in Venus' harsh environment is the largest challenge
- Venus Science and Technology Definition Team (VSTDT) stated, "[The] key to enabling a Venus Flagship mission is the ability to conduct investigations and tests in Venus simulation chambers."[1].
- VICI (Venus In-Situ Chamber Investigations) is available for use at NASA Goddard Space Flight Center in Maryland
- It is available for testing of small flight components/instruments and short-term experiments that require Venus-like high temperatures and pressures

Chamber Specifications

Figure 3. Images taken of the chamber where (A) shows the entire chamber and apparatus, (B) shows the interior of the chamber with removable stand for holding samples or instruments, and (C) is the lid one port used for thermocouples, other lids with optional viewports and/or throughputs can be used.

- Constructed of 316 stainless steel
- Maintains a steady temperature of 740K and pressure of 95.6 bar for ~48 hours
- Operates under CO_2 and/or gas mixtures that include N_2 and SO_2 (at ppm levels)
- Can run at temperatures and pressures lower than Venusian surface conditions
- LabVIEW software records simultaneous temperature and pressure readings

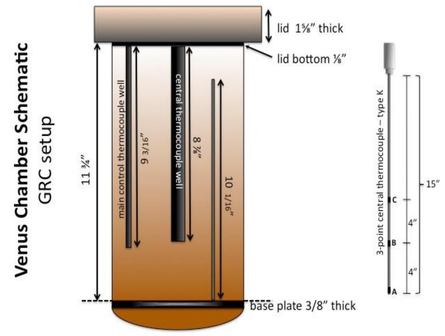

Figure 4. Cartoon of chamber interior with dimensions and the relative positions of the thermowells. The actual working space is slightly smaller because of volume taken up by thermowells.

Previous Work

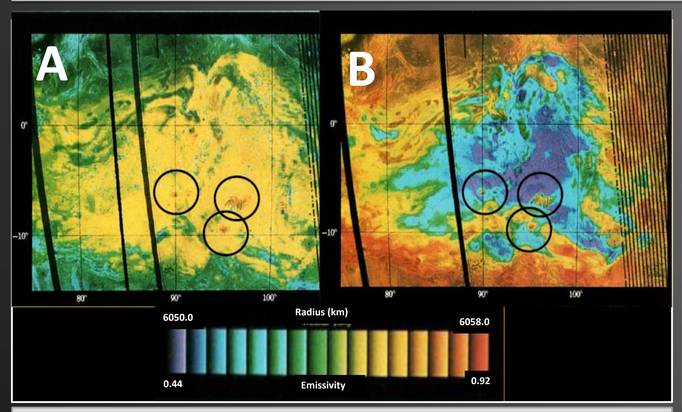

Figure 1. Topography (A) and emissivity (B) maps of Ovda Regio of the surface of Venus measured by Magellan [5]. Circles indicate the areas of highest altitude where reflectivity values return to average surface values.

Figure 2. (A) Image of discoloration of tellurium sample after 18 hours at 380°C and 55 bar.

- Atmosphere
  - 96.5% CO_2, 3.5% N_2 & 155 ppm SO_2
- 460°C, 95 bar, 18 hrs
- 380°C, 55 bar, 18 hrs
  - Stable under these conditions for good candidate status

Table 1. XRD analysis of each sample showing mineral composition by percentage. Iron sulfides and mercury telluride are potential candidates.

Original Sample	460°C, 95 bar		380°C, 55 bar	
Te	Te TeO_2	83% 17%	Te TeO_2	78% 22%
Bi_2S_3	Bi_2S_3	100%	Bi_2S_3	100%
FeS_2	FeS_2	100%	FeS_2 S	85% 15%
Bi_2Te_3	Bi_2Te_3	100%	Bi_2Te_3 BiTe	91% 9%
HgTe	HgTe Te	41% 59%	HgTe Te	61% 39%

Contact Information

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References

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Acknowledgements

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