Jet Propulsion Laboratory
California Institute of Technology

Southern Research Europa Ice Questions

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Material Properties to Test

- Compression Test
  - Young's Modulus, Poisson's ratio, UCS
- Brazilian tensile test
  - UTS
- 4 point bending or 3 point bending
  - UTS
- Volume + mass measurement
  - Density
- Charpy Impact Test
  - Impact strength
- Fracture toughness
  - KIC
  - KIIC
- Photo/Microscope
  - Grain size
- Thermal Testing
  - Thermal conductivity
  - Thermal expansion
- Other
  - Bifurication
  - Shear strength

What Can SRI Do ?

- **Testbed**
  - How large of a testbed can SRI provide? What size of ice sample can be included in that testbed? Can multiple samples be tested at once?
  - What is the temperature range over which samples can be tested?
  - Can the testbed be evacuated down to Europa surface pressure?
  - What physical properties (Young's Modulus, UCS, UTS, thermal conductivity, density, porosity, grain size, etc.) can SRI test for a given ice sample and how will they perform such tests?
  - What chemistries might be acceptable for testing within the chamber (corrosive, pH, salts, etc.)?

- **Ice sample preparation**
  - Does SRI have facilities to prepare cryogenic samples of relevant size?
    - There is a standard protocol (called the "standardized method") for preparing ices with minimal porosity. It requires degassing deionized water (through boiling), freezing it, grinding it, sieving it (to select a particular grain size), placing it in a mold and pulling vacuum, then backfilling with water and freezing again. Can such a protocol be implemented in a lab at SRI?
  - Could multiple ice samples be prepared simultaneously?
  - Can SRI work with corrosives and other hazardous chemicals, such as sulfuric acid?
  - Can ices be prepared with layers of different compositions?

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