**Draft Hydrogen on Carbon Benchmark Option A**

**Benchmark Parameter:**

1. Total H2 and D2 adsorbed (cm3/g)
2. Total H2 and D2 desorbed (cm3/g)

**Reported Parameters:**

BET Surface Area (m2/g)

Pore size Distribution (m2/g)

Lattice Parameter (Å)

**Sample Preparation:**

**Sample weight:** 1-5 grams

**Sample Preparation:** Cutting, grinding, sanding and polishing TBD

**Sample Material (Focus on IG-110U):**

**IG-110U:** Industry standard nuclear graphite will be a good starting point for all applications. MITR has large quantity from same batch.

**A3-Graphite**: Likely graphite matrix that is used in triso-fuel pebble. Can be acquired from INL.

**Carbon-Carbon Composite:** Proposed in ORNL plate fuel design. Material used as core barrel and structural support in hexagonal assembly. [1] CRFC instrument liner tubes in the Mk1 PB-FHR at the outer lobes of the center reflector. [2] TBD.

**Activated Carbon:** High absorption demonstrated at high temperature 700 degrees C and of interest for use as an absorber. High total solubility should facilitate acquiring a coherent and consistent TPD and total solubility curve. TBD.

**Test Conditions:**

1. Adsorption:

**Temperatures:** 600, 700 degrees C (FHR operating Temperatures)

**Pressures:** 0.1 Pa, 1 Pa, 10 Pa, 100 Pa, 100 kPa (FHR conditions and Fusion)

**Pre-analysis condition**: degas at 1100 degrees C, 2 hours at <10-5 Pa vacuum

1. Desorption:

**Temperatures:**  Saturate at 600, 700 degrees, desorb up to 1100 degrees C

**Pressures:** Saturate at100 Pa H2,desorb at **<**10-5 Pa

**Pre-analysis condition**: degas at 1100 degrees C, 2 hours at <10-5 Pa vacuum

**References:**

1. V. K. Varma, D. E. Holcomb, F.J. Peretz, E. C. Bradly, D. Ilas, A. L. Qualls, N. M. Zaharia, *AHTR Mechanical, Structural, and Neutronic Preconceptual Design*, Oak Ridge National Lab, TM-2012/320, Oak Ridge, Tennessee, September 2012.
2. C. ANDREADES et al., *Technical Description of the “Mark 1” Pebble-Bed Fluoride-Salt-Cooled High-Temperature Reactor (PB-FHR) Power Plant*, UCBTH-14-002, University of California at Berkeley, September 30, 2014.