Closing Panel:

Addressing Real World Challenges in High-Performance Ceramic Materials

William M. Carty, Ph.D.

Chief Technology Officer
Materials Research Furnaces, LLC

Professor Emeritus of Ceramic Engineering
New York State College of Ceramics at Alfred University



Advanced Ceramic Component Manufacturing

Carbides, nitrides, composites, etc.

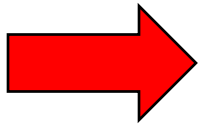
Sustainable and well-managed processing.

A “well-understood” process, in control?

Thermal processing:

Pyrolysis/de-binding

Sintering

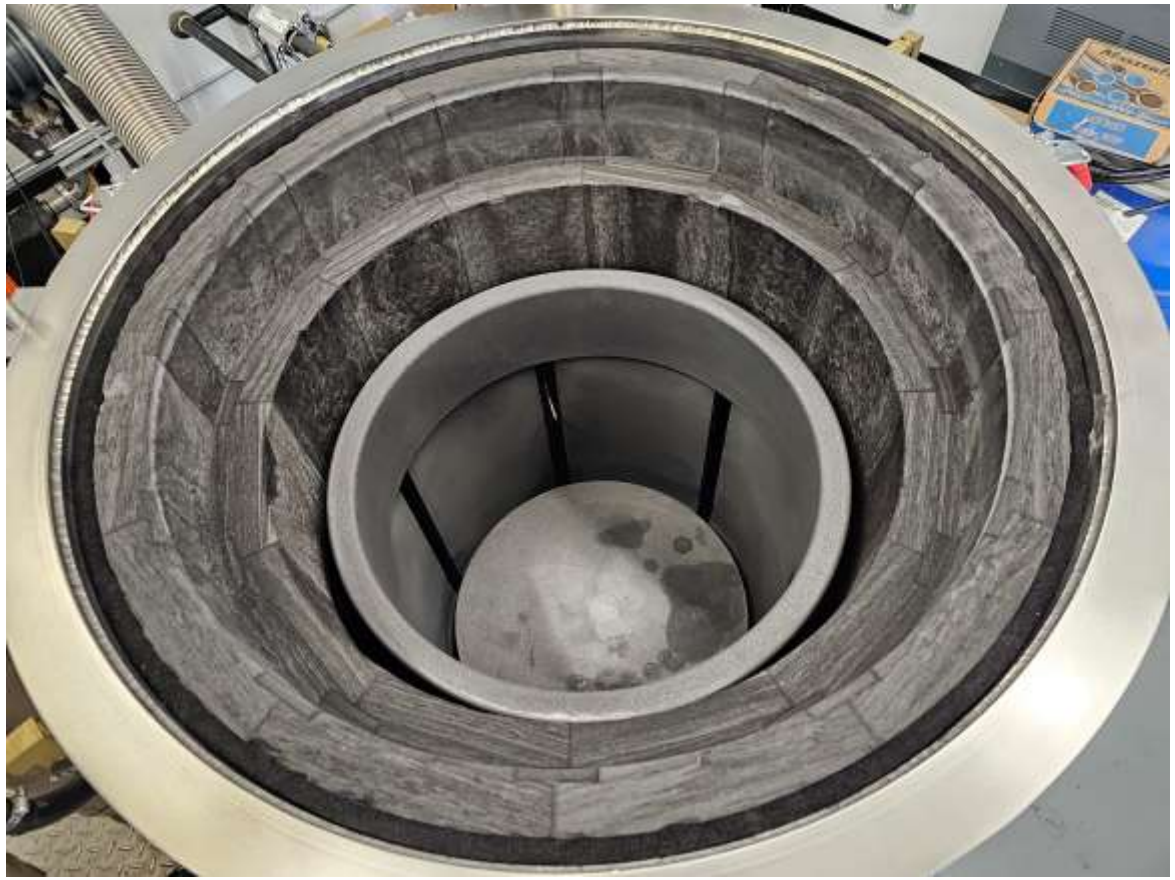


Atmosphere & Temperature control

Metal Hot Zone



Graphite



Atmosphere Control *versus* Vacuum

"Vacuum" has become synonymous with high-purity atmospheres and atmosphere control.

This is incorrect.

How do we obtain, and maintain, high-purity atmospheres?

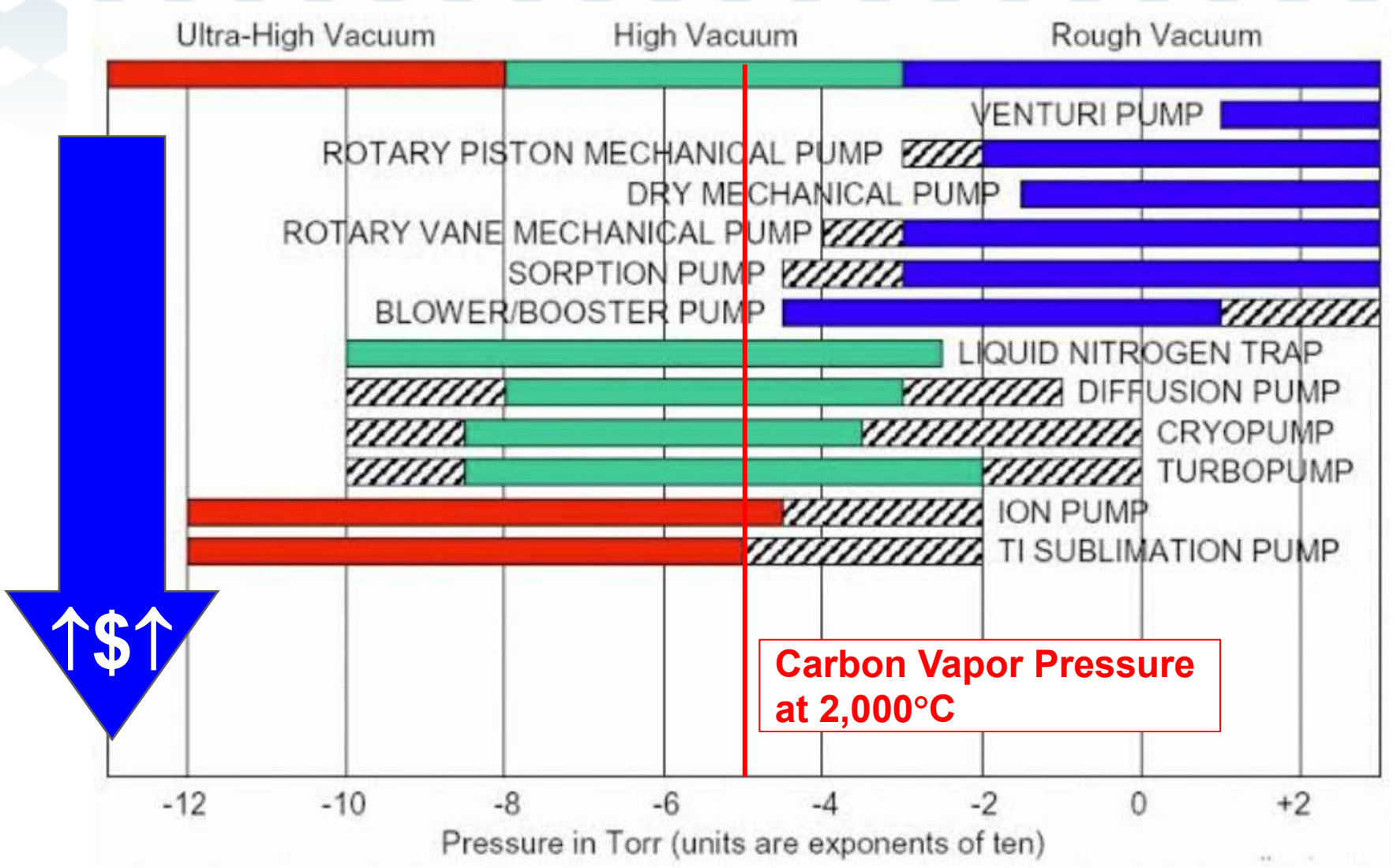
What are the limitations and considerations??

Vacuum Pumps

Increasing cost with increasing vacuum

Is high vacuum necessary?

Potentially no.



But, is high vacuum necessary? → NO

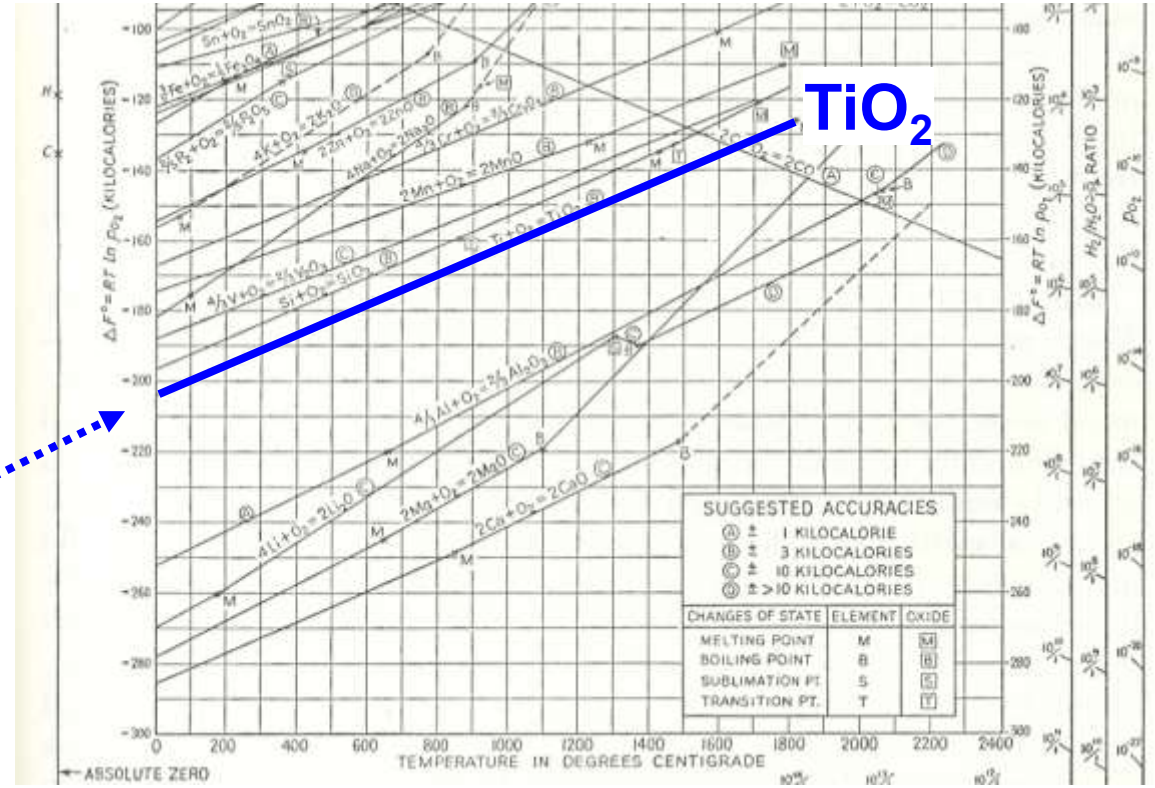
Implement a purge cycle

Evacuate · purge (gettered N_2 or Ar)

Evacuate · purge (gettered N_2 or Ar)

Evacuate · Run sweep gas.

Ellingham Diagram



Getter: Ti metal in a heated tube, metered flow rate

Eliminates oxygen in the gas stream.

Eliminates the need for UHP Ar (or N_2; i.e., 99.999) → ***RGA***

Thank you.

Questions?

William M. Carty, Ph.D.
Materials Research Furnaces, LLC
WCarty@mrf-furnaces.com

