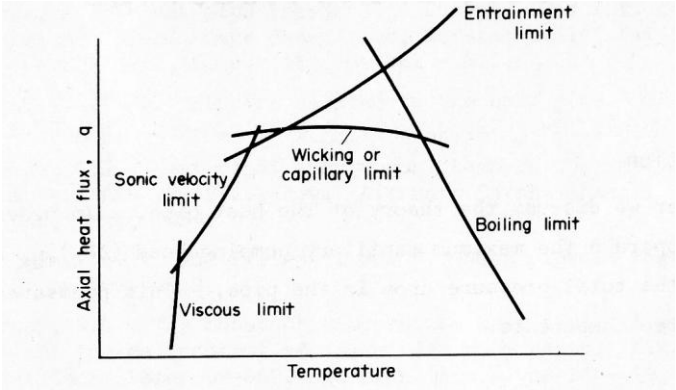
PPPL Proposed to Develop Actively Cooled and Wetted Li Capillary Porous System for Divertor Targets

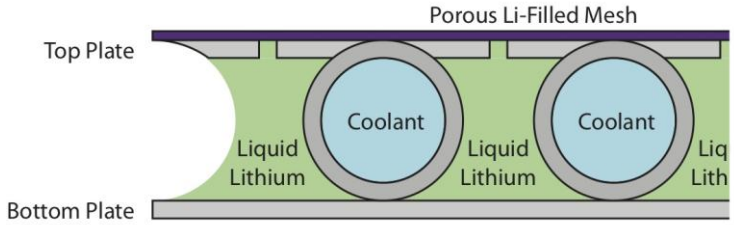
- **Three major areas of materials science research are necessary to design, construct and operate confidently liquid metal CPS PFCs on high-power, potentially long-pulse or steady state, front-line tokamak experiments:**
  - **Active wetting**
    Validate large-area active wetting strategies.
  - **Contamination and decontamination**
    Demonstrate ability to produce and recover clean large-area capillary wetted surfaces.
  - **High-power plasma-material interactions**
    Determine distribution between radiated power, evaporative cooling and power delivered to CPS surface, in high power plasma



- **Facilities were identified to perform these studies**
  - **High vacuum chamber now in C-128** to be upgraded to allow studies of wetting "sorptivity": $v_w = S^2/(2x_w)$, test decontamination strategies in NSTX-like vacuum.
  - **Bruce Koel's lab** to measure surface and bulk contamination.
  - **Collaboration with Magnum-PSI** for high-power plasma testing.
- **Proposed schedule is October 2012 – October 2015**

NSTX-U Should Test Large-Area CPS Divertor in 2016

- **Pre-tokamak R&D essential to accelerate & reduce risk of advanced PFCs**
- **If DOE Proposal is funded, NSTX-U should begin design of large-area CPS divertor to be installed in 2016.**
  - Information on wetting and contamination /decontamination of lithium CPS is scheduled to be available by January 2014.
  - Could begin design to be confirmed by Magnum-PSI in 2014 (wetting) and 2015 (wetting + cooling).



- **If DOE Proposal is not funded…**
  - Could do wetting and contamination/decontamination studies with PPPL facilities, collaboration with Koel nominally "cost-free".
  - Magnum-PSI has separate funding, so perhaps some activity could proceed with NSTX support for PPPL activities.
- **Replaceable Divertor Module would provide valuable tests in either case.**
  - If no DOE funding, and no Magnum-PSI, RDM could play the role of Magnum PSI in 2014 – 2015, before we install large-area divertor in 2016.
  - If DOE funding, RDM would provide valuable additional tests in 2014 – 2015, before installing large-area divertor in 2016.