Session on
Alternative Materials for PFCs

Talks 14:10 – 15:30

Discussion 15:30 – 16:10

Coffee Break 16:10 – 16:30

Poster 16:30 – 18:30

R. Neu
MPI for Plasma Physics

3rd IAEA Technical Meeting on Divertor Concepts
04 November 2019, Vienna, Austria

Introduction ‘Alternative Materials for PFCs’

Liquid metals (LM) as alternative to solid PFMs?

Liquids potentially attractive because

- **absence of embrittlment**
  → **(almost) no change in thermomechanical properties**
- **replenishing capabilities**
  → small armour thickness
  ⇒ **potentially higher heat load capability**
  → more resilient to transients
  ⇒ **no persistant melt layers**
  ⇒ **enhanced vapour shielding as emergency running properties**

Introduction ‘Alternative Materials for PFCs’

Liquid metals (LM) as alternative to solid PFMs?

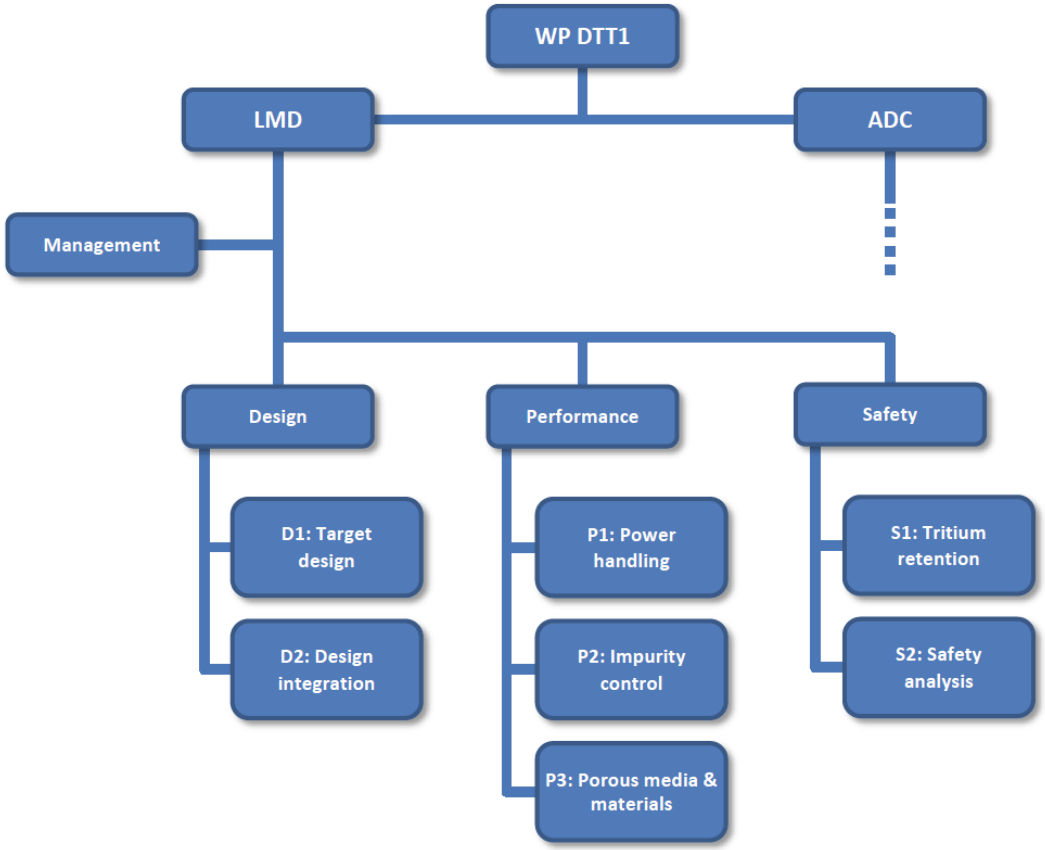
Potential issues

- **unduly high erosion**
  (evaporation/sputtering/chemical erosion)
  → **plasma contamination**
  (radiation/dilution)
  → **huge material migration**
  (operational / safety issues)
  → **excessive tritium retention**
  (retention / co-deposition)
- **complicated technical implementation**
  → **free LM surface**
  (stability during transients, plasma movement, …)
  → **integration into ‚real PFCs‘**
  (dual (coolant) loops, internal temperature gradients, …)

Introduction ‘Alternative Materials for PFCs’

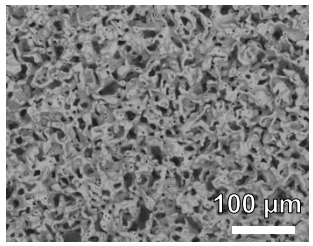
How to tackle the issues

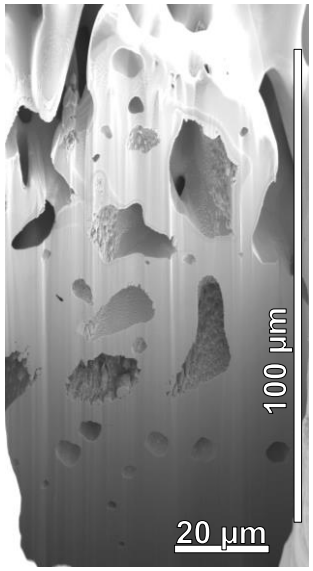
Example: WBS EUROfusion LM work package (T. Morgan)



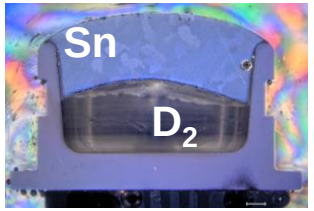
Surprises may wait beyond the horizon …

D-exposure (10^{20}/(m^2s) of solid Sn @ 495 K (24 h)





liquid Sn @ 515 K (1.25 h)



(A. Manhard)

Alternative Materials for PFCs

Fast Flowing Liquid Metal Divertor Design Options: Experimental and Numerical Studies (30 min)

Kolemen Egemen

United States of America

Liquid Metal Conceptual Divertor Designs for the European DEMO (30 min)

Thomas Morgan

Dutch Institute for Fundamental Energy Research, Netherlands

Analyses and Experiments Towards a Lithium Vapor Box Divertor (20 min)

Robert Goldston

Princeton University, United States of America

Posters related to Alternative Materials for PFCs

Behaviour of Tin under Low-Temperature Deuterium Plasma Irradiation
NEU, R.
(MPI für Plasmaphysik)

Characterization of liquid metals as prospective divertor materials under transient plasma loads
MAKHLAI, Vadym
(Nat. Science Center “Kharkov Institute of Physics and Technology”, Inst. of Plasma Physics)

Liquid Metal Modeling for Plasma Facing Components
KHODAK, Andrei
(Princeton Plasma PhysicsLaboratory)

Assessment of vapor shielding efficiency in lithium divertor for steady-state and transient events
MARENKOV, Evgeny
(National Research Nuclear University MEPhI, Moscow, Russian Federation)

Discussion ‚Alternative Materials for PFCs‘

1. What are the critical issues

2. How critical are they?

   What are the most productive paths to address them?

3. Any other issues the participants want to bring up.