Final Agenda

Workshop on Tritium Control and Capture in Salt-Cooled Fission and Fusion Reactors: Experiments, Models and Benchmarking

Salt Lake City; October 27-28, 2015
DoubleTree by Hilton Hotel Salt Lake City Airport, Salt Creek Ballroom

The objectives of the workshop are to bring together researchers involved in experiments, modeling and benchmarking for tritium control at ~700°C in liquid salts and related system to (1) exchange information and enable future exchange of information, (2) initiate an effort for benchmarking of experiments and models, and (3) encourage cooperation between different groups working on the same challenges. The workshop includes tritium sorption behavior in carbon because (1) fluoride-salt-cooled high-temperature reactors (FHRs) and some types of molten-salt reactors (MSRs) have carbon matrix fuels and/or carbon moderators and (2) several carbon forms are leading candidates to remove tritium from high-temperature salts.

The workshop goals are information exchange between the participants to enable future cooperation. The agenda will be modified based input from participants. Abstracts, papers, and presentations will be posted on the website (*http://tcw15.mit.edu*).

Tuesday: October 27

7:30 – 8:30 Continental Breakfast – *Stillwater Poolside Atrium*

8:30 – 10:00 *Session 1. Welcome, Introductions, and Workshop Goals (MIT, CAS, Wisconsin)*

Welcome

Introductions

Workshop Goals

Brief summaries of different programs (U.S., China, Europe, etc.)

Charles Forsberg (MIT NSE)

Xiaodong Sun (OSU)

10:00 – 10:30 Break

10:30 – 12:00 *Session 2. Environment for Tritium Control*

This session will include descriptions of (1) the different tritium-generating energy systems that use high temperature (~700°C) salts, (2) the environments in which the tritium is generated, and

(3) constraints on tritium removal. The goal is to define the challenges—common challenges and unique challenges with tritium capture and control associated with each technology.

Fluoride-salt-cooled High-temperature Reactors (Tritium environment: clean salt, carbon in system, possibility of small quantities of fission products, tritium is waste or useful product, redox control strategy?)

Fusion ARC concept (Tritium environment: clean salt, no carbon in system, high-efficiency recovery of tritium because tritium is the fuel, very high tritium levels, redox control?)

Molten salt reactor (MSR) (Tritium environment: salt with fission products and actinides, carbon may or may not be in the system, redox controlled by U^{+3}/U^{+4}, tritium is waste or useful product)

This session will also include discussions on tritium generation rates, required recovery rates, and various limits (Goals) that differ for various technologies.

Charles Forsberg (MIT NSE) "Fluoride-salt-cooled High-Temperature Reactors"

Brandon Sorbom (MIT PSFC) "The Fusion ARC Concept"

Cristian Contescu and Tim Burchell (ORNL) "Hydrogen – Carbon Interactions"

Tim Burchell and Cristian Contescu (ORNL) "AGR Fuel Compact Development Program"

12:00 – 1:30 Lunch – *Stillwater Poolside Atrium*

Wei Liu (CAS) "TMSR Project in China"

Michael Laufer (UCB) "Tritium and Chemistry Management for the Mark-1 PB-FHR"

1:30 – 3:00 *Session 3. Tritium handling experience*

Greg Staack (SRNL) "An Overview of SRNL Tritium Activities"

Masashi Shimada (INL) "Overview of Tritium and molten salt FLiBe research at Safety and Tritium Applied Research (STAR) facility"

David Carpenter (MIT NRL) "Experience with Tritium Evolution During Irradiation of MSRE Flibe in the MITR"

3:00 – 3:30 Break

3:30 – 4:30 *Session 4. Characteristics of salt, corrosion, and redox on tritium control challenge*

Chemistry determines tritium chemical form ($^3H_2$ or ^3HF or ^3HCl) and thus transport of tritium to the environment, tritium holdup in the system, and tritium control options. Tritium control tightly coupled to corrosion control in most but not all cases. Options for redox control and implications of those options on tritium control and capture to be discussed. (Example, if hydrogen used as part of redox control or salt cleanup, may have significant to remove with tritium)

Thomas Chrobak (UW) "FLiBe Electrochemistry and Materials Corrosion Research at UW-Madison"

Huali Wu (UW) "Effect of hydrogen on tritium control"

Wednesday October 28

7:30 – 8:30 Continental Breakfast – *Stillwater Poolside Atrium*

8:30 – 9:30 *Session 5. Tritium and Carbon*

Carbon is a large sink for tritium and a potential capture method for tritium in multiple chemical forms. What is known and not known

Huali Wu (UW) "Experimental work on tritium transport analysis in Flibe-Graphite system"

Stephen Lam (MIT NSE) "Tritium Control Using Carbon Outside the Core"

9:30 – 10:00 Break

10:00 – 12:00 *Session 6. Tritium Capture*

Systems for tritium capture at high temperatures in salts from salts, the gas space above, and related environments.

Paul Humrickhouse (INL) "Tritium Permeation Control and Extraction – Perspectives from Fusion System Studies"

Wei Liu (CAS) "Tritium-Control Technologies for TMSR System in CAS"

Floren Rubio (UNM) "Research on Techniques for Tritium Sequestration and Removal at UNM"

12:00 – 1:00 Lunch – *Stillwater Poolside Atrium*

1:00 – 2:30 *Session 7. System models of tritium transport*

John Stempien (INL) "Tritium Transport and Corrosion Modeling in the Fluoride Salt-Cooled High-Temperature Reactor"

David Senor (PNNL) "Irradiation Testing in Support of the Tritium Production Enterprise"

2:30 – 3:00 Break

3:00 – 5:00 *Session 8. Closeout and path forward*

David Carpenter (MIT NRL) "Planned FHR IRP-2 Tritium Experiments"

Bryan Wallace (UNM) "Investigation of Tritium Control and Release Mitigation Options in Double-Wall Twisted-Tube Heat Exchangers (DT-HXRs)"

Charles Forsberg (MIT NSE)

Thursday October 29

7:30 – 8:30 Continental Breakfast – *Stillwater Poolside Atrium*

8:30 – 10:00 *Side Meetings as Appropriate*

10:00 – 10:30 Break

10:30 – 12:00 *Side Meetings as Appropriate*