

# RIMANUS Meeting 20240315

## 20240315092542-rimanus<sub>meeting</sub>20240315

*<2024-03-15 Fri>*

### **1 Define the Problem**

#### **1.1 Question: Which scenario is our focus?**

#### **1.2 Different scenarios have different flow velocities.**

- Normal condition: flow velocity is about 6 m/s.
- Core Disruptive Accident (CDA): there is likely no such high velocity.

### **2 Scenario: CDA**

#### **2.1 Questions:**

- What is the process of CDA?
- Which process would be interesting for other researchers and significant for the nuclear safety?
- Or which process is particularly blank and demanded?

#### **2.2 Literature review:**

- There is natural circulation flow in SFR.
- The sudden loss of coolant may never happen.
- The reason for sodium boiling is generally "Breakdown of the forced circulation".
- It takes longer before the sodium boiling finally happens.

### 3 Bubble behavior

- There is not enough study on bubble behaviors on liquid metal.
- Then the question comes: How similar are water and liquid sodium?  
What is the difference between them?
- Difference:
  - Heat transfer: Liquid sodium » Water
  - Viscosity: Water > Liquid sodium
  - Surface Tension: Liquid sodium > Water
- Coalescence:
  - (Water) Collision ↑ Coalescence ↑
  - (Water) Viscosity ↑ Coalescence ↑, Surface Tension ↑ Coalescence ↓
  - (Water) Surface Tension ↑ Coalescence ↓
- Inference:
  - It is harder for bubbles in liquid sodium to coalesce.

### 4 Quotes

Together with a high capacity of natural circulation flow establishment in SFR, the boiling of the total sodium mass under residual power deposition (after loss of forced circulation) takes several hours. This duration is about 15 hours to get the total coolant boiling, without taking into account natural circulation flow. (bachrataComparativeStudySevere2021)

In SFR ‘pool-type’ reactors, the loss of coolant due to loss of pressurization e.g. pipe rupture is practically eliminated. Consequently, the severe accident scenarios with fast total loss of cooling are practically eliminated. (bachrataComparativeStudy-Severe2021)