Contribution ID: **419** Type: **Invited Oral**

Study of the pebble beds for tritium breeding blanket

Wednesday 7 June 2017 16:40 (20 minutes)

The solid blanket is a candidate tritium breeding blanket concept for Chinese Fusion Engineering Test Reactor (CFETR), and the thermal and mechanical characterization of the ceramic pebble beds are vital for researchers to know for a reliable solid blanket design. Some related numerical and experimental studies were conducted at University of Science and Technology of China and China Academy of Engineering Physics, etc. in China. A theoretical model, coupling the contact areas with bed strains, was developed to predict the effective thermal conductivity of mono-sized ceramic pebble bed. The influences of parameters such as properties of pebbles and gas, bed porosity, pebble size, gas flow, contact area, thermal radiation, contact resistance are all taken into account in this model. Besides, the behaviors of granular materials under mechanical cycling were investigated, including the effect of mechanical cycling on the granular compaction and the evolutions of the elastic modulus and force chains with the discrete element method (DEM) method. DEM-CFD simulation of purge gas flow characteristics in a solid breeder pebble bed was studied also. Furthermore, two experimental platforms using transient thermal probe method and transient plane source method respectively were built and operated to measure the effective thermal conductivity of the pebble beds. Li4SiO4 and Li2TiO3 as promising candidate tritium breeder materials have been considered. The measured temperature ranged from RT to 600℃, and the helium or air at 1 bar was used as filling gas. The experimental results were obtained and some phenomena were discussed.

Eligible for student paper award?

No

Author: Prof. CHEN, Hongli

Co-authors: Mr WANG, Shuang; Dr WANG, Shuai; Dr ZHANG, Hao; Dr WANG, Xiaoliang

Presenter: Prof. CHEN, Hongli

Session Classification: W.OP3: Blankets and Tritium Breeding: Solid Breeders

Track Classification: Blankets and tritium breeding