Contribution ID: **142** Type: **Poster**

Hydrogen and Carbon Monoxide Release at RITM-200 SMR under LOCA Conditions due to Core Oxidation

An innovative project of land-based water-cooled Russian design iSMR named RITM-200 is planned to use ATF technology –fuel rod enclosed in chromium-nickel alloy cladding [1, 2]. Due to integral design SB-LOCAs are most common severe accidents to happen.
Under LOCA conditions hydrogen release is determined mostly by the steam oxidation of core materials. Contribution of boron carbide and steel oxidation to the hydrogen source grows with application of ATF and becomes comparable with zirconium.
In contrast with most reactor materials, the oxidation process of boron carbide is complex enough: depending on the thermo-hydraulic conditions various reactions (and reaction products) are possible. From a fire and explosion safety point of view, the most important gaseous reaction products are flammable hydrogen and carbon monoxide.
The purpose of this study is to estimate the hydrogen and carbon monoxide release at RITM-200 SMR under LOCA conditions due to core oxidation.
Simulation has shown that, in comparison with LWR, the hydrogen release at RITM-200 is 1-2 orders of magnitude less, and the main contributors are zirconium, boron carbide, and steel. Carbon monoxide release is also noticeable, but are somewhat overestimated due to model assumptions, as well as the lack of experimental data for the process.

1. Advances in Small Modular Reactor Technology Developments. A supplement to: IAEA Advanced Reactors Information System (ARIS). 2022 Edition.
2. Kulakov G.V., Vatulin A.V., Ershov S.A. et al. Prospects for Using Chromium Nickel Alloy 42KhNM in Different Types of Reactors. Atomic Energy, Vol. 130, No 1, 2021 (DOI: 10.1007/s10512-021-00768-x).

Country OR International Organization

Russian Federation

Email address

evgen307250@gmail.com

Confirm that the work is original and has not been published anywhere else

YES

Author: DOLZHENKOV, Evgenii (Nuclear Safety Institute of the Russian Academy of Sciences)

Co-authors: Dr KISELEV, Arkadi (IBRAE RAS); RYZHOV, Nikolai (IBRAE RAN); CHALYY, Ruslan (IBRAE RAS)

Presenter: DOLZHENKOV, Evgenii (Nuclear Safety Institute of the Russian Academy of Sciences)

Track Classification: Topical Group C: Safety, Security and Safeguards: Track 8: Demonstrating SMR's Safety Case