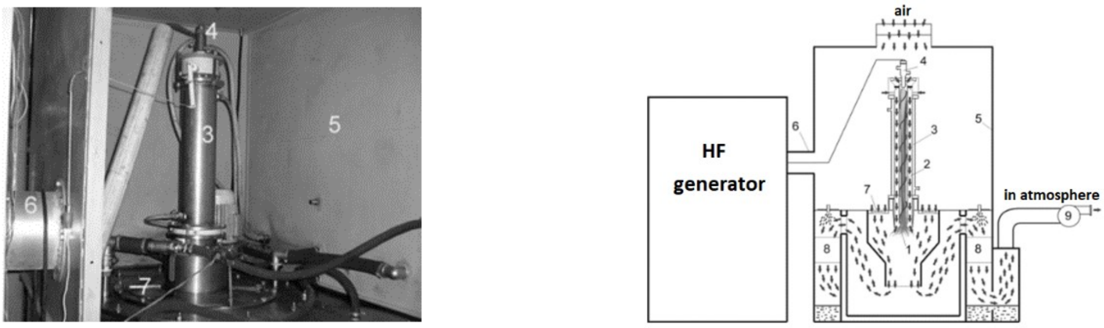

a) b)

Fig. 1. Plasma module based on the HFT-plasmatron: 1 – HFT-discharge, 2 – discharge chamber of quartz glass, 3 – plasmatron case, 4 – electrode, 5 – module protective case, 6 – HF-generator feeder, 7 – reactor with an impeller, 8 – unit for wet cleaning of exhaust gases, 9 – exhaust fan

Figure 2 shows a scheme of the plasma module reactor based on the HFT-plasmatron.

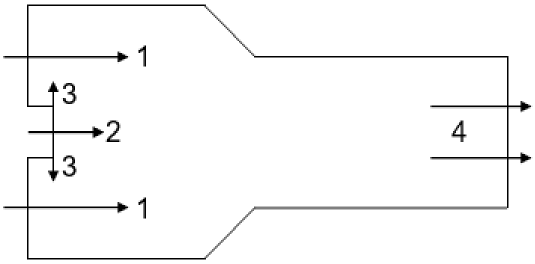

Fig. 2. Scheme of the plasma module reactor based on the HFT-plasmatron: 1 – air flow, 2 – air plasma stream, 3 – solution disperser, 4 – exhaust gases

In the process of calculations and experiments, it was determined that the optimal parameters for plasmachemical synthesis (at a generator power of 60 kW and a frequency of 13.56 MHz) are the following: temperature 1200 ± 100 °C, plasma-supporting gas – air, mass ratio of phases 65% wt. air - 40% wt. initial solution.

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RADIATION SAFETY AND METHODS FOR ENSURING IT

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Radiation is the release or transmission of energy in the form of waves or as moving subatomic particles. These particles are high-energy particles that cause ionization. Ionizing radiation is when an atom loses or gains an electron, while non-ionizing radiation is the bounce off or the passing of rays through matter without displacing the atoms. The major types of ionizing radiation are alpha rays, beta rays, gamma rays, and x rays. Non-ionizing radiation sources include ultraviolet rays, visible light, infrared rays, and microwaves. Radiation sources are normally natural or artificial. Natural radiation sources are cosmic, terrestrial, and internal radiation. Sources from medical, industry, and consumer activities are elements of artificial radiation [1]. Radiation safety refers to safety issues related to radiation hazards arising from the handling of radioactive materials or chemicals and exposure, which include x-ray machines, electron microscopes, particle accelerators, atomic energy plants, nuclear explosions or accidents. The risks of excess radiation exposure are not insignificant, potentially leading to a variety of health issues, from cataracts, damage of the DNA cells in the human body, acute radiation syndrome (ARS), radiation injuries, hair loss, birth defects, and the development of cancers [2]. For the reasons stated above, it is critical to strictly adhere to radiation protection and safety principles and measures such as ALARA (as low as reasonably achievable). This principle means that even if it is a small dose, if receiving that dose has no direct benefit, one should try to avoid it. To do this, you can use three basic protective measures in radiation safety: time, distance, and shielding [3,4]. However, there are other measures, namely; dispersal, source reduction, source barrier, personal barrier, decorporation, effect mitigation, optimal technology, and limitation of other exposures. The usage of personal protective equipment for a first responder or radiation worker could go a long way to minimize exposure; equipment such as respirators for inhalation; protective clothing from radioactive material off of skin and hair; alarming dosimeters for time; and tracking accumulated doses in an area with elevated radiation levels. If radioactive material gets on to skin, clothing, or hair, it is important to get it off as quickly as possible [5].

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SIMULATION OF NEUTRONICS DEPENDENCE OF SILICON CARBIDE COATING LAYER FOR SURFACE MODIFICATION OF ZIRCONIUM ALLOY CLADDING CONCEPTS

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Surface modified Zr-alloys are envisioned to replace and improve the robustness of current and future light water reactors (LWR) fuel cladding as part of the accident tolerant fuel (ATF) cladding concepts. Several potential cladding materials such as Cr, Mo, SiC, FeCrAl and many others have been coated on varieties of Zr-alloys and studied in many literatures. In this study, SiC micro- composite deposited on Zr-alloy (E110) were simulated under normal reactor operating conditions in order to assess its coating thickness dependence on key neutronic parameters such as the reactivity coefficient, K-effective value and atomic densities under the burnup conditions with Monte Carlo code, SuperMC. The simulation results show that external covering of Zr-1Nb alloy tubes fuel rods with SiC coatings between 0.05mm to 0.25 mm thick has negligible effects on the generation of neutrons. Also, the corresponding reactivity penalties measured are very small and proportional to the coating thickness, and the change in the atomic density of each isotope of the reaction product is almost negligible.