is of great prac-tical importance for the calculation of emergency regimes at nuclear power plants with water-cooled reactors of a new generation.

In this regard, in the IPPE, calculation and experimental studies of the processes of entrainment of boric acid due to solubility in steam were carried out. The experiments were performed at the test facility at a steam pressure of 0.2 MPa, which corresponds to the pressure in the WWER-TOI reactor in the event of an accident with a break in the main circulation circuit. The concentration of boric acid in the experiments varied in the range 16–380 g / kg H_2O. The computational modeling of the processes of solubility of boric acid in steam and droplet entrainment made it possible to evaluate the influence of these processes on the rate of accumulation of boric acid in the reactor in case of an accident.

The results obtained will help to substantiate the safety of new NPP projects with WWER reactors in order to ensure that a small accident does not develop into a serious one with the possible release of radioactive fission products into the environment and causing great ecological damage.

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ENVIRONMENTAL PROBLEMS RELATED TO MULTI LAYERED PACKAGING WASTE

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Modern packaging has made life easier in many ways: food preparation and storage, longer shelf life for products, medicines, frozen foods, processed foods, takeout foods. Unfortunately, such convenience has come at an environmental price. Multi-layered packaging has been producing since the ‘70s and are commonly comprised of layers of PET, Al, PP, PE, ect. Over 80m tonnes of multilayered packaging are produced globally, per annum, of which the EU contributes more than 20m tonnes, with an expected growth of ~7 %.

Keywords: Environmental problems; Multilayer Packaging; Waste.

Currently, Multilayer packaging is widely used for the preservation and distribution of food, beverages, pharmaceuticals, and other consumable products; the plastic packaging used for this purpose represents 40 % of the total production of plastic in the EU and requires more than 19 million tons of oil and gas to produce, with an esti-mated annual increase of 5–7 % [1–2].

Multilayer packaging consists of various polymers such as PE/PA or PP/PET as well as aluminum layers. Such composite materials fulfil functions that monomaterials do not offer. For example, they protect food and consumer goods from light or oxygen [Fig. 1]. For recycling though, the individual materials of the packaging must first be separated. However, this has not simply process, which is why such a waste stream has not been considered recyclable and instead is thermally recovered, which can produce gas and ash exhausts that also have a negative environmental impact. Or disposal on the landfill. On the contrary, the recycling of single-layer films, such as PE, PP, PVC, PS, or PET films, is technically solvable and currently there are many companies working in the processing of these films and remanufacturing them into new products [3, 4, 5].

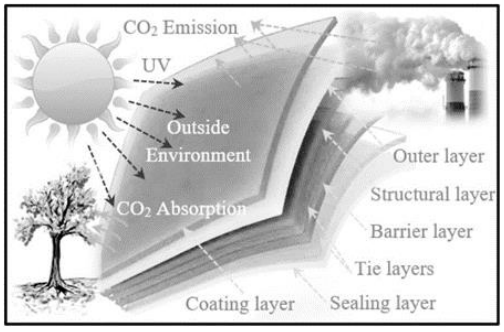

Fig. 1. – Basic components of multilayer flexible packaging

During a review of packaging recycling practices in the EU, it was found that mechanical and thermal/chemical treatment (e.g., chemolysis, pyrolysis, fluid catalytic cracking, hydrogen techniques, and gasification) are the predominant industrial technologies. However, generally these recycling practices suffer from a number of disadvantages related to e.g., their recycling rate, energy consumption, CO2 emissions, sustainability, thermomechanical or lifetime degradation, the immiscibility of polymer blends, undesirable carbon residue, wax, and gas emissions produced, as well as high costs [5–6].

The recycling stage and separation of the polymeric fraction from aluminum foils of composite packaging still remains the main challenge for the CE, especially since the performance and quality of all CE stages depends entirely on the recycling stage, yet the average packaging recycling rate in the EU is rather low at the moment (<66 %) [7, 8, 9, 10].

As already mentioned, because of their poor recyclability, most multilayer packaging waste are usually incinerated or landfilled, counteracting the efforts towards a circular economy.

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QUANTITATIVE DETERMINATION OF THE SOAP CONTENT OF NATURAL WATERS

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The use of the cationic dye Pironin G for quantitative extraction-photometric determination of higher carboxylic acids in real objects is proposed.

Keywords: extraction; Pyronin G; extraction photometric determination; carboxylic acids.

Carboxylic acids are diverse in structure and widely distributed in nature. The study of the quantitative, qualitative composition and dynamics of carboxylic acids in environmental objects is necessary not only to study biological processes, but also to control the content of these substances as anthropogenic pollutants of the biosphere of this class. For many acids with toxic properties the maximum concentration limits are determined. Therefore, the quantitative determination of these compounds is of great interest.

In our earlier works it was shown that a quantitative extraction-photometric determination of higher carboxylic acids with cationic dyes Safranin T and Pyronin G is possible. They are the only cationic dyes that are stable in strong alkaline media and can be used to determine these acids. On the base these dyes the methods for the determination of higher carboxylic acids in some organic liquids have been developed.

We determined the optimal pH value of the aqueous phase (11.25), an organic solvent (5 % n-octanol-1 in heptane) and found that interfering ions of various nature, from the very hydrophobic singly charged SCN^- to very hydrophilic doubly charged SO_4^{2-} do not change the concentration of the cationic dye Pyronin G in aqueous phase in real natural concentrations, i.e. will not affect the quantitative measurements with Pyronin G [table 1].