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Steady-state model of carbon dioxide absorption as a part of mathemathical description of on-site nuclear fuel cycle

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Nuclear fuel cycle (NFC) closure is significant objective for contemporary energetics. One of the perspective ways at this direction is closed NFC based on fast neutron reactors using nitride fuel.
One of the problems of irradiated nitride fuel (INF) reprocessing is radioactive carbon-14 handling. Unlike oxide fuel nitride fuel will contain nitrogen-14, which partially will transform to carbon-14 during irradiation. Since INF dissolution operation is carried out in oxidative media, carbon-14 in the carbon dioxide form will enter gas purification system. Hence, gas stream should be cleaned up from carbon dioxide. The simplest way for capturing carbon dioxide is absorption by alkali solution in packed absorber.
The paper presents the mathematical model for simulation of carbon dioxide absorption by alkali solution in packed absorber. The model presented is designed for estimation of influence of different process parameters (i.e. temperature, pressure) on efficiency of carbon dioxide capture and absorber dimensions. At the same time model provides ability to perform balance calculation of absorbent regeneration. Optimization calculation and consideration of absorbent regeneration are the objective for model future development.
Scheme of absorption process, algorithm and results of calculation that can be used for calculation of dimensions of apparatus, process optimization and technical-economical estimation are provided in this paper.

Primary author: Mr TKACHENKO, Vladimir (Bochvar Institute (VNIINM))

Presenter: Mr TKACHENKO, Vladimir (Bochvar Institute (VNIINM))

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