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Radiation Stability of Hydrocarbon Diluents of TBP in Two Phase System Used in SNF Reprocessing

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The modern technology of reprocessing of irradiated fuel nuclear power plants (NPP SNF) is based on the Purex process, which uses a solution of tributylphosphate (TBP) in an inert dilu-ent as extractant. There are most commonly used aliphatic hydrocarbons with straight chain and mixtures thereof (a mixture of n-paraffins) or mixtures of iso-paraffins (tetrapropylene) or a mixture of n-paraffins with iso-paraffins and naphthenes (dearomatised kerosene). High ra-diation and chemical exposure faced by the extractant lead to the formation and accumulation of impurities, which affect its hydrodynamic and selective properties. Therefore the extractant is constantly regenerated in the extraction cycle by soda washing but a part of the degradation products is not removed by this treatment and gradually accumulates. The basic role in dete-rioration of hydrodynamical characteristics of the extractant is played by the products of ra-diation-chemical decomposition of hydrocarbon diluents among which the main contribution is from the products of nitration, oxidations and the mixed products of interaction with TBF.

The purpose of the given work is comparison of radiation stability of branched diluent Isopar-M, mixtures of i-paraffins C13 (C11- 7,11 %, C12 - 17,25%, C13 - 72,15%, C14 and above - less 2.9 %) and comparison to data on destructions of RED-1, and also substantiation of choice of both high boiling diluent, and the recycling solution allowing to wash away organic ligands and admixed elements from the extractant thus not creating difficultly separable emul-sions and deposits, formed, first of all, by sodium salts VKK.

After each cycle of irradiation a reextraction was performed, an organic phase was halved: one half was recycled with Na2CO3, and another half was recycled with NaHCO3 for com-parison. After each contact the speed of aliquation and after each cycle in both variants the size of an interphase tension were determined. The latter was determined by modified Re-binder's device by method of detection of the maximal pressure in a bubble of an organic phase.

Comparing data on an irradiation of studied diluents with investigated earlier RED-1 and RJ-13, it could be noted, that a superficial tension on soda regeneration at irradiated C13 and Isopar-M is a little bit higher, than at irradiated RED-1 and RJ-13. Thus speeds of aliquation of emulsions at soda processing at C13 and Isopar-M have close values and since a doze of an irradiation of 200 kGy practically does not change up to a doze 500 kGy, keeping value within the limits of 0,2-0,3 of mm/s while for RJ-13 speed of aliquation monotonously de-creases and at a doze 550 kGy is 0,1 mm/s, and RED-1 at dozes more 200 kGy does not un-dergo aliquation. Thus, newly examined diluents are characterized by more stable properties at an irradiation in comparison with studied earlier.

Thus, Isopar-M has appreciable advantage over C13 at the stage of regeneration, especially at use of 1 M solution of NaHCO3 increasing in the irradiation process. For a choice of a spe-cific diluent for radiochemical plant it is necessary to consider both individual dissolving abil-ity, including propensity of formation of the 2nd organic phase, and specificity of production.

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