ROLE OF REACTION MEDIA IN "GREENING" RADIATION-INDUCED POLYMERIZATION OF WHITE PHOSPHORUS

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The transition from micro- to nanoscale systems brings major changes to the basic physico-chemical properties of polymers. The polymers of elemental phosphorus (phosphorus-containing polymers, PCPs) display this phenomenon, for example, in magnification of reactivity, changes of self-ignition temperature and of other critical technological characteristics. It determined our special attention to the progress of synthesis technology of nanoscale inorganic polymers with the tailor-made properties. At the heart of the technology designed, there are principles of "green" chemistry which allow to take into account the current trends in inorganic synthesis, in particular, the usage of ionizing radiation and varying of media properties for the nanoscale particles growth control.

This type of the process control allowed us to move from the acting principle of physico-chemical investigations "composition – properties" to a principle "synthesis conditions – composition – properties". The control by means of varying media properties may be realized by different approaches: variation of the solvent nature (limitation on solubility of phosphorus in different solvents) and variation of media polarity and the structural organization of the solution (incorporation of ionic liquids (ILs) into the reaction media). The data of the Table demonstrate the changes in the radiation-chemical yields of PCPs.

Table. G-values (radiation-chemical yields) of PCPs (molec.(P_4) /100 eV) in the presence of various ILs in DMSO/benzene mixture (1:1) (T=298 K, $D^{\bullet}$ = 0,59 Gy/sec)

Ionic liquid	$[BMIm]^+$ $[CF_3SO_3]^-$	$[BMIm]^+$ $[BF_4]^-$	$[BMIm]^+$ $[PF_6]^-$	$[EMIm]^+$ $[N(SO_2CF_3)_2]^-$	$[BMPyr]^+$ $[N(SO_2CF_3)_2]^-$	$[HMIm]^+$ $[(C_2F_5)_3PF_3]^-$	without IL
$[P_4]_0/[IL]$	0,075	0,072	0,069	0,215	0,081	0,134	–
G-value of PCP	455±46	47±5	69±7	60±6	31±3	32±3	8±1

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