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Phosphorous containing polymeric materials for solid state nuclear track detection applications: A brief review

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In 1958, D A Young detected latent tracks in LiF crystal which lead to development of a new field solid state nuclear track detection (SSNTD) technique. After the invention, many materials like minerals, glasses, plastics, etc. were used as detectors in SSNTD application. For the first time, in 1966, K. Becker used phosphate glass as nuclear track detector. Barium phosphate BP-1 glass, LG-750 phosphate glass and various other sensitive phosphate glasses have been utilized as track detectors. Eventually, it was found that glass detectors showed poor radiation sensitivity as compared to many plastic detectors. Plastic materials like cellulose nitrate, bisphenol-A polycarbonate (lexan), poly (allyl diglycol carbonate) (CR-39), etc. were then used as track detectors. Out of which CR-39 was found out to be the best detector with high radiation sensitivity compared to all other detectors. Most of the reported polymeric track detectors have either $-SO_2-$, $-SO_3-$, $-CO_3-$ or $-ONO_2$ linkage; there are no reports about the use of phosphate-carbamate containing polymers in track detection. Already, we have reported the application of poly triallyl phosphate PTAP and their copolymers with allyl diglycol carbonate (ADC) in international journal. At Goa University, we are involved in developing polymeric track detectors containing different radiation sensitive functionalities. Here, we report preparation of some novel polymeric track detectors having carbonate-phosphate; carbamate-phosphate linkages for their use in SSNTD. Poly (triallyl phosphate-co-pentaerythritol tetrakis allyl carbonate) i.e. poly (TAP-co-PETAC) and poly (triallyl phosphate-co-N-allyloxy diallyl carbamate) i.e. poly (TAP-co-NADAC) were prepared and successfully tested for SSNTD application. The alpha sensitivity as well as alpha track detection efficiency of the copolymers was compared with that of imported CR-39. It is observed that the alpha sensitivity of the copolymers was much better than that of CR-39.

Biography

Diptesh G Naik is pursuing his Doctoral degree under the guidance of Prof. Vishnu S Nadkarni at Goa University since 2012. He has completed his Master's degree from Goa University, Goa in the year 2009 securing 3rd rank in Physical Chemistry. He has 2 publications in international journals and 1 Indian patent.

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