

Extraction of chemical information using positron annihilation spectroscopy in metal-chitosan complex

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The importance of functional polymeric material considering its properties at the molecular level has been attracting increasing attention in materials science. As an intuitive theoretical concept, the free volume has been widely used to explain the physicochemical or macroscopic properties correlated with molecular level of polymer [1]. Positron annihilation spectroscopy (PAS) was proved to be successful in characterizing for free-volume hole properties. Considering that free volume properties, e.g., free-volume hole size and concentration, of polymer can be well correlated with the detected orthopositronium (o-Ps) annihilation information (lifetime and intensity), of essential importance for the development of molecular insights is a better understanding of positron annihilation physical essence or characteristics in polymeric system with complex chemical environment [2,3].

Our previous studies of addition of chloride salt ions coordinated with chitosan molecular chains confirmed the chemical inhibition effect on positronium formation [4]. In the present work, we investigate the effect of three kind of anions existed in polymer matrix on positron annihilation characteristics. A combined use of positron annihilation lifetime spectroscopy (PALS) and Coincidence Doppler broadening (CDB) spectroscopy to illustrate how anions, including chloride ion, nitrate ion and acetate ion, coordinated in molecular chains influence the annihilation of thermalized positrons in chitosan matrix

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