

PHOSPHINIMINES AS POTENTIAL TECHNETIUM ENVIRONMENTAL SENSORS

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ABSTRACT

Phosphinimines, $R_3P=NSiMe_3$, undergo hydrolysis to form the phosphininium cation, $R_3P=NH_2^+$, which forms the ion pair $[R_3P=NH_2^+][X^-]$ in the presence of an anion. Preliminary studies show that in the presence of TcO_4^- , $Ph_3P=NSiMe_3$ forms $[Ph_3P=NH_2^+][TcO_4^-]$ and $[Ph_3P=NH_2^+]$ is selective for TcO_4^- over other anions. Technetium-99 is present as environmental contamination in the form of $^{99}TcO_4^-$, which is extremely mobile. Currently available methods to measure this contamination are time consuming and tedious. A method to preconcentrate and measure ^{99}Tc environmental contamination in a quick and efficient manner is needed. The selectivity of the phosphininium cation for TcO_4^- may make phosphinimines suitable for such preconcentration and possibly for measurement. Several phosphinimines were synthesized and characterized for their stability and selectivity with $^{99}TcO_4^-$, including $Ph_3P=NSiMe_3$, (9-anthracenyl) $Ph_2P=NSiMe_3$, (1-naphthyl) $Ph_2P=NSiMe_3$, and (p-COOMe) $C_6H_4Ph_2P=NSiMe_3$. (9-anthracenyl) $Ph_2P=NSiMe_3$ and (1-naphthyl) $Ph_2P=NSiMe_3$ include possible reporter groups and (p-COOMe) $C_6H_4Ph_2P=NSiMe_3$ contains a linking moiety for incorporating reporter groups or attaching the phosphinimine to a polymer support. The use of internal and external reporter groups to generate a signal in the presence of TcO_4^- is also investigated.