REAGENTS LEAD TETRAACETATE

(FOR B.Sc.part-1II (Hons)

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Molecular formula of lead tetraacetate is given below

$Pb(CH_3COO)_4$

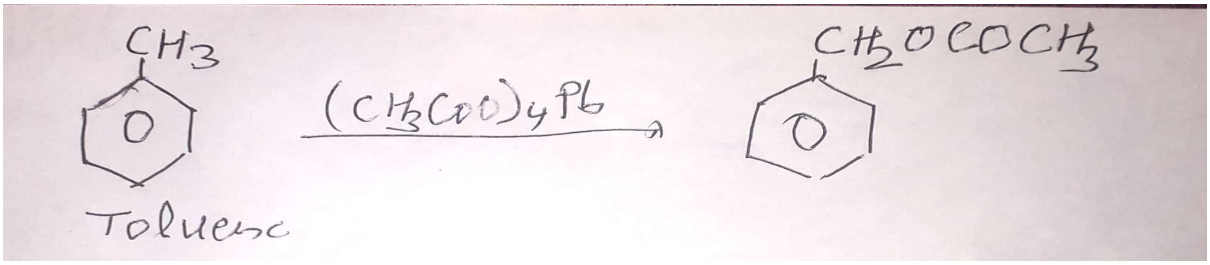
METHOD OF PREPARATION

When the mixture of acetic acid and acetic anhydride is heated with red lead oxide at 328 K- 353 K we get solution of lead tetraacetate which upon crystallization gives crystals of lead tetraacetate.

$$Pb_3O_4 + 8CH_3COOH \xrightarrow[\text{------}]{(CH_3COO)_2O} Pb(CH_3COO)_4 + Pb(CH_3COO)_4 + 4H_2O$$

APPLICATION :--LEAD tetraacetate is widely used as oxidising agent , as methylating agent and acetoxylating agent .some of them are mentioned below :-

(1) (a) When toluene is treated with lead tetraacetate we get benzyl acetate as oxidising product.



(b) Lead tetra acetate oxidises α -glycols into ketones. Here vicinal hydroxyl gr. Undergo fission of the C-C bond between the hydroxylated carbon atoms. Eg

$$> C\text{-}OH \qquad (CH_3COO)_4Pb \qquad > C=O$$
$$| \quad \text{---------->} \quad +$$
$$> C\text{-}OH \qquad\qquad > C=O$$

Eg pinacol with lead tetraacetate gives acetone

$$\begin{array}{lll} CH_3 & CH_3 & \qquad\qquad\qquad\qquad CH_3 \\ | & | & \qquad (CH_3COO)_4Pb \qquad\quad \backslash \\ CH_3\text{-}C\text{-} & C\text{-}CH_3 & \text{---------->} \; 2 \quad C=O \\ | & | & \qquad CH_3COOH \qquad\quad / \\ OH & OH & \qquad\qquad\qquad\qquad CH_3 \quad \text{ACETONE} \end{array}$$

Eg,

It oxides α-hydroxy acid into aldehyde

$$R\text{-}CH(OH)\text{-}COOH \xrightarrow{(CH_3COO)_4Pb} RCHO + CO_2 + 2CH_3COOH + Pb(CH_3COO)_2$$

ALDEHYDE

(2) As acetoxylating agent

Lead Tetra Acetate is widely used for the introduction of Acetoxy ($OCOCH_3$) group in active methylene group and hydrocarbon.

e.g.

$CH_3\text{-}CO\text{-}CH_3 \xrightarrow{(CH_3COO)_4Pb}$ $CH_3COO\text{-}CH_2COCH_3$ + $CH_3CO\text{-}O\text{-}CH_2COCH_2OCOCH_3$

Acetone

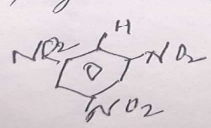
$CH_3\text{-}CO\text{-}CH_2\text{-}CO\text{-}OC_2H_5 \xrightarrow[\text{Benzene}]{(CH_3COO)_4Pb}$ $CH_3\text{-}CO\text{-}CH(OCOCH_3)\text{-}COOC_2H_5$

Ethyl-Acetoacetate

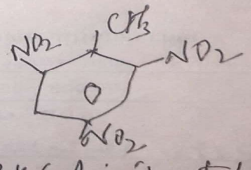
(3) As methylating agent

On heating lead tetra acetate gives methyl group ($-CH_3$)

eg.



$\xrightarrow[\Delta]{(CH_3COO)_4Pb}$



2,4,6 Trinitrobenzene

2,4,6 trinitro toluene

(4) In 1966 Mihailovic recently used this reagent to oxidise primary amine having an alpha methylene gr into cyanide.

RCH_2NH_2 --› RCH=NH ----› RC≡N

##########THANKS#######

(4)