

MS32-P11 Lead(II) acetate: anhydrous polymorphs, hydrates and by-products. Room temperature phosphorescence.

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Lead(II) acetate (hereafter referred to as $\text{Pb}(\text{Ac})_2$) is a very common salt with many and varied uses throughout history: a) as a sweetener and sugar substitute (known as "sugar of lead"), despite its toxicity; b) in cosmetics, as a hair colouring product, and in skin whitening lotions; c) in medical uses, as an astringent and as a remedy for sore nipples, in solution with lead(II) oxide (Goulard's extract); d) in industrial uses, as a hydrogen sulfide detector, as a mordant in dyeing and textile printing, as a drier in paints and varnishes; etc. However, the behaviour of this -in principle- simple salt and its structures and decomposition process have remained unclear. In this sense, only lead(II) acetate trihydrate was characterized and solved to date.

In this study, we unravel the thermal behaviour and show the different compounds (hydrates and by-products) that appear for this salt. Thus, two enantiotropic polymorphs of the anhydrous salt, a novel hydrate (with $\text{Pb}(\text{Ac})_2/\text{H}_2\text{O}$ ratio 2:1) and two decomposition products are reported (corresponding to the 3:1 and 1:1 stoichiometric mixtures of $\text{Pb}(\text{Ac})_2/\text{PbO}$), being the structure of all of them solved for the first time. The compounds present a variety of molecular arrangements, being two-dimensional (2D) or one-dimensional (1D) coordination polymers. A thorough thermal analysis, by DSC and TGA, was also carried out and to study the behaviour and thermal data of the salt and its decomposition process, in inert and oxygenated atmospheres, identifying the phases and by-products that appear.

One of the most relevant aspects is the luminescence in two of the compounds: lead(II) acetate hemihydrate and tetralead(II) oxo-hexaacetate ($3\text{Pb}(\text{Ac})_2/1\text{PbO}$ ratio). These salts were analyzed by UV-Vis spectroscopy and were found to be phosphorescent at room temperature.

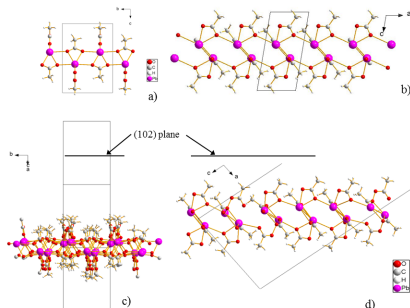


Figure 1. Crystal structures of anhydrous high and low temperature polymorphs of lead(II) acetate, $\text{Pb}(\text{Ac})_2\text{-A}$ (a and b)

and $\text{Pb}(\text{Ac})_2\text{-B}$ (c and d), respectively. The structures are presented along the axes a (a) and b (b), and parallel to the plane (102) (c), and along the axes b (d), respectively.

Keywords: Polymorphs, hydrates, by-products, lead(II) acetate, XRD, phosphorescence, DSC, TGA