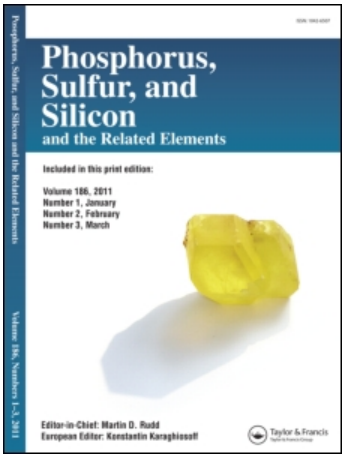


## Phosphorus, Sulfur, and Silicon and the Related Elements

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# Phosphates with Two Kinds of Condensed Anions

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# Phosphates with Two Kinds of Condensed Anions

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Up to now a dozen of inorganic condensed phosphates containing two anions with different degrees of condensation have been reported.

We describe two additional examples of such rare compounds : $Pb_2Cs_3(P_4O_{12})(PO_3)_3$ and $CaNb_2O(P_2O_7)(P_4O_{13})$.

## A - $Pb_2Cs_3(P_4O_{12})(PO_3)_3$

This salt has been characterized during a systematic investigation of the $P_2O_5$–PbO–$Cs_2O$ system. This is the first evidence for the existence of tetraméta-polyphosphates.

Crystal data : triclinic, $P\bar{1}$ with

| | | |
|---|---|---|
| a = 6.808(5) | b = 7.875(6) | c = 22.12(1) Å |
| α = 86.23(1) | β = 96.96(1) | γ = 113.98(1)° |
| V = 1075.4 Å$^3$ | Z = 2. | |

Structure refined with R = 0.048 for 3350 independent reflexions. Centrosymmetrical $P_4O_{12}$ ring anions alternate with $(PO_3)_\alpha$ chains.

## B - $CaNb_2O(P_2O_7)(P_4O_{13})$

Characterized during investigations in the system $P_2O_5$–$Nb_2O_5$–CaO this salt is the first example for the coexistence of $P_2O_7$ and $P_4O_{13}$ groups in a condensed phosphate.

Crystal data : monoclinic, C2/m with

| | | |
|---|---|---|
| a = 13.264(8) | b = 10.574(5) | c = 12.393(5) Å |
| β = 96.09(5)° | V = 1728.8 Å$^3$ | Z = 4. |

Structure refined with R = 0.049 for 1204 independent reflexions. The $P_4O_{13}$ groups have a twofold symmetry, while the $P_2O_7$ groups have a mirror one.