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NOTE

$Ba_2Zn_3P_{10}O_{30}$, the First Example of a Decametaphosphate Ring

$Ba_2Zn_3P_{10}O_{30}$ was obtained during a systematic investigation of the condensed phosphates with two bivalent cations. It is the first metaphosphate with 10 phosphorus atoms in the ring.

Crystals were grown by dissolving $BaCO_3$ and $ZnCO_3$ in orthophosphoric acid, H_3PO_4, and heating this solution at 400°C for a few days. Their monoclinic symmetry is described by the space group $P2/n$ with cell constants $a = 21.738(15)$, $b = 5.356(5)$, $c = 10.748(8)$ Å, $\beta = 99.65(3)°$. There are two rings per unit cell. Indexed powder diffraction data will be given in another article (*1*).

The final R factor attained in refining the structure was 0.041 for 2759 reflections and 206 parameters.

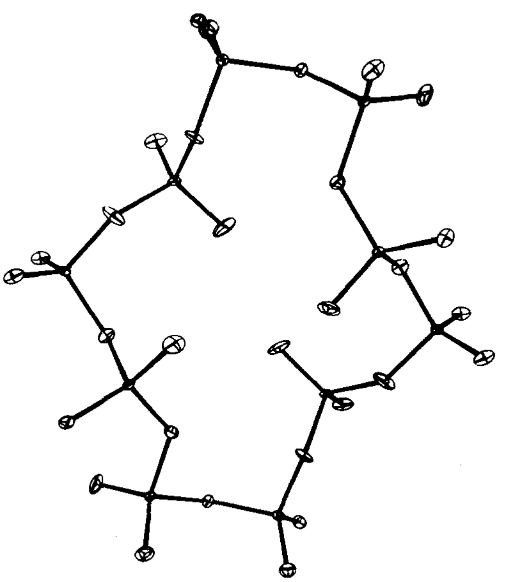

FIGURE 1

The $(P_{10}O_{30})^{-10}$ ring has a twofold axis and its dimensions are about 11 × 10 Å in the $(\vec{a}, \vec{c})$ plane and 5 Å along $\vec{b}$ (Fig. 1).

Detailed geometrical features of the $P_{10}O_{30}$ group will be described later (*2*). They are similar to those observed in already known cyclophosphate $(P_nO_{3n})^{-n}$ anions with $n = 3, 4, 5, 6$, and 8.

The $P_{10}O_{30}$ rings are linked by ZnO_4 tetrahedra along the twofold axis, by ZnO_6 and BaO_9 polyhedra in a three-dimensional way. In fact, these polyhedra are sharing corners, edges, and faces, and so they form a three-dimensional framework having very large channels. Along the axes of these channels one finds linear arrays of alternating $P_{10}O_{30}$ rings and ZnO_4 tetrahedra.

This new type of anion, called decametaphosphate, is also the first 10-tetrahedra ring characterized among other condensed anions, such as silicates and germanates.

References

1. M. BAGIEU-BEUCHER, to be published.
2. M. BAGIEU-BEUCHER, A. DURIF, AND J. C. GUITEL, in press.

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