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Phosphorus, Sulfur, and Silicon and the Related Elements

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STRUCTURE OF COMPOUNDS IN SYSTEMS P-O-N AND Me-P-N

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In recent years phosphorus-nitrogen compounds containing oxygen or metal have caused increasing interest. Structural basis of these compounds is formed by variously interconnected tetrahedra with phosphorus atoms located in the centre with nitrogen atoms situated on tetrahedra tops. Part of the nitrogen atoms can be substituted by those of oxygen.

Study of phosphorus oxynitride synthesis has shown that in P-O-N system a number of crystalline phases can be obtained, as well as amorphous and glass-like substances, properties of which are determined by oxygen and nitrogen ratio. Two modifications of oxynitride PON have been obtained with structures of cristobalite and α -quartz, and crystalline phases with a smaller content of oxygen.

The majority of compounds in the Me-P-N system possesses isostructural analogs among phosphorus oxynitrides and silicon-oxygen compounds. This is explained by two basic reasons: meal ions, situated in the holes between the tetrahedra and forming a bond with nitrogen atoms, reduce the tetrahedra coordination in a way similar to the case where three-coordinated nitrogen atoms are substituted by two-coordinated oxygen ones. Formation of one-type structures is promoted by small distinctions in atomic dimensions of phosphorus and silicon, nitrogen and oxygen, as well as by accordance of coordination of these atoms in structure-forming frameworks.