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

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### Reactions of Sulfur with Some Unusual Organophosphorus Compounds in Low Coordination States

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## REACTIONS OF SULFUR WITH SOME UNUSUAL ORGANO-PHOSPHORUS COMPOUNDS IN LOW COORDINATION STATES

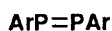
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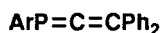
**Abstract** Reactions of sulfur with some unusual organophosphorus compounds in low coordination states such as diphosphenes, phosphallenes, and diphosphallenes were carried out.

### INTRODUCTION

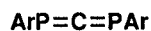
We have been successful in isolation and characterization of several organophosphorus compounds in low coordination states by utilizing the 2,4,6-tri-*t*-butylphenyl moiety (here abbreviated to the Ar group) as a protective group.<sup>1</sup> Such unusual organophosphorus compounds as diphosphene (**1**),<sup>2</sup> 1-phosphaallene (**2**),<sup>3</sup> and 1,3-diphosphaallene (**3**)<sup>4</sup> having low coordinated phosphorus atom(s) of coordination number 2 were isolated and characterized as sterically protected stable compounds.



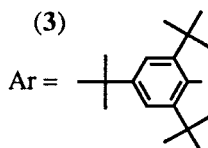
(1)



(2)



(3)

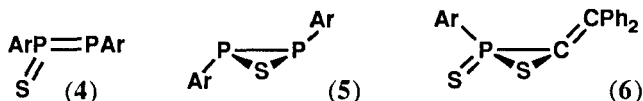


We report here the reactions of sulfur with such unusual organophosphorus compounds.

### REACTIONS OF SULFUR WITH DIPHOSPHENES, PHOSPHA-ALLENES, AND DIPHOSPHAALLENES

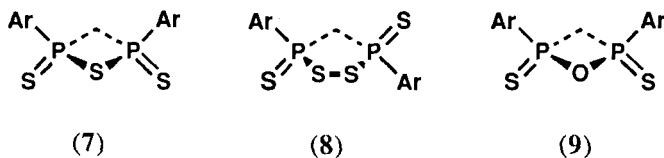
The reaction of sulfur with **1** in triethylamine resulted in the formation of a phosphorus and sulfur analog of azoxy compound **4**,<sup>5</sup>

which was further converted to thiadiphosphirane **5** as a very stable small-ring compound.<sup>6</sup>



The reaction of sulfur with **2** gave methylenethiaphosphirane sulfide **6**,<sup>7</sup> the structure of which was determined by the X-ray analysis.

The reaction of sulfur with **3** in the presence of DBU gave several new heterocyclic compounds containing phosphorus and sulfur or oxygen, **7**,<sup>8</sup> **8**,<sup>9</sup> and **9**.<sup>10</sup> The structures of these reaction products have been analyzed by the X-ray crystallography.



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