

SYNTHESES OF PHOSPHORUS CONTAINING HETEROCYCLES
BY THE OZONOLYSES OF ALKENYL PHOSPHORAMIDATES

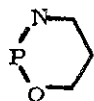
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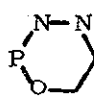
Ozonolysis of O-(3-butenyl)-N,N-bis(2-chloroethyl)phosphorodiamidate afforded 2-[bis(2-chloroethyl)amino]-4-hydroperoxytetrahydro-2H-1,3,2-oxazaphosphorine-2-oxide which on deoxygenation yielded 4-hydroxycyclophosphamide, an active species of the antitumor agent cyclophosphamide. By the ozonolyses of O-alkenyl phosphoramidates bearing a nitrogen mustard residue, various phosphorus containing heterocycles (A ~ F) related to the cyclophosphamide active species were synthesized.



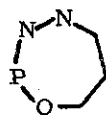
(A)



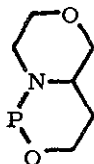
(B)



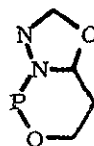
(C)



(D)



(E)



(F)