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

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## Polyfunctional Phosphonic Acids, Phosphinoxides and Phosphines

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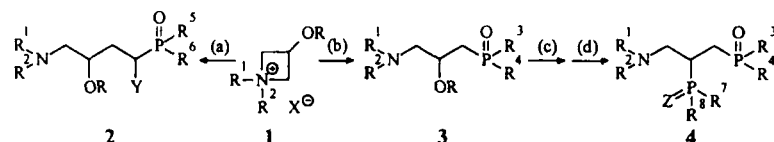
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## Polyfunctional Phosphonic Acids, Phosphinoxides and Phosphines

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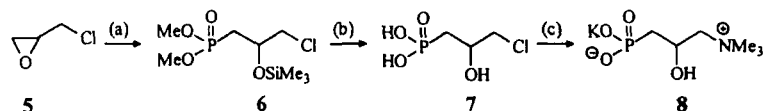
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As part of our studies on the synthesis of mono- and bis-phosphonic acids, phosphine oxides and phosphines containing amino and hydroxy groups attached to tricarbon or tetracarbon chains [1], we now report our efforts to find a rational synthesis of compounds 2, 3 and 4:



Reagents: (a):  $R^1R^2PCH_2Y$ , BuLi; (b):  $R^1R^2P(O)H$ , NaH; (c): 1. Pd/C,  $H_2$ , 2. TsCl, Py; (d): 1. Bu'OK, Bu'OH, 2.  $R^3R^4P(Z)H$ , NaH.

The method utilizing azetidinium salts 1 as the key starting material (see above) has some limitations, due to the methylating properties of N,N-dimethyl 3-hydroxy azetidinium halogenides. For this reason we took an alternative approach to the synthesis of phosphocarnitine, taking advantage of the fact that compound 6 can be obtained according to Azuhata and Okamoto [2]:



Reagents: (a):  $(MeO)_2P(O)SiMe_3$ ,  $ZnCl_2$ ; (b): 1.  $Me_3SiBr$ , 2. MeOH,  $H_2O$ ; (c): 1. MeOH aq., 2.  $K_2CO_3$ .

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