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POSITION SPECIFIC α-TERT-ALKYLATION OF KETONES

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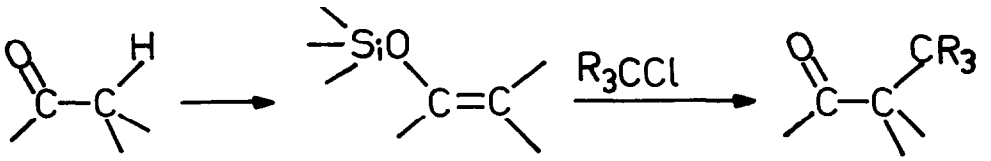
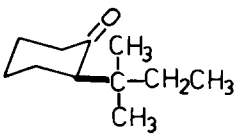
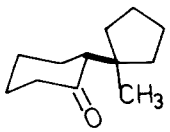
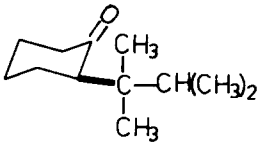
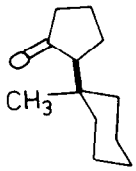
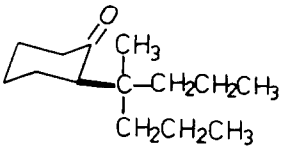
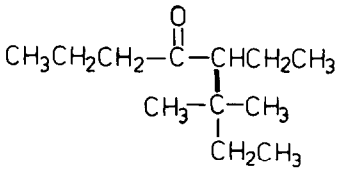
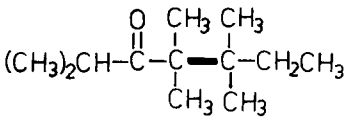
Summary: Lewis acid mediated α-tert-alkylation of ketones via their silyl enol ethers is possible utilizing a variety of branched tertiary alkyl halides. The latter react position specifically without undesired rearrangements.

α-Tertiary alkylation of carbonyl compounds cannot be achieved using enolate anion chemistry due to elimination[1]. Recently we solved this classical problem by reacting silyl enol ethers with tertiary alkyl halides in the presence of such Lewis acids as $ZnCl_2$, $FeCl_3$ or $TiCl_4$[2] :



Whereas the method allows for the regiospecific tert-alkylation of unsymmetrical ketones, position specificity in the tertiary halide has not yet been studied. This is a potentially serious problem, since it is known that many attempted Friedel-Crafts tert-alkylations lead to the predominance of products derived from rearranged secondary carbonium ions[3]. Hydride ion abstraction from the products is also observed as an undesired side reaction[3]. We now wish to report that our standard tert-alkylation procedure using $TiCl_4$ at -40° to -60°C circumvents such difficulties and affords position specifically the desired tert-alkylated ketones. Isomers resulting from rearrangement or other processes are not observed. Utilizing the appropriate tertiary chlorides and silyl enol ethers, we have prepared the tert-alkylated ketones illustrated in Table 1. All compounds gave correct elemental analyses and were characterized by IR, H-NMR and ^{13}C-NMR spectroscopy.

Table 1. α-Tert-alkylated Ketones

Ketone[a]	Yield[b] %	Ketone	Yield %
	71 (82)		65 (80)
	46 (55)		60 (73)
	73 (81)		60 (68)
	52 (64)		

a) The bold faced lines indicate the new C-C bonds.

b) Yields refer to isolated products based on silyl enol ethers. The numbers in brackets pertain to NMR yields.

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References:

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2. M.T.Reetz and W.F.Maier, Angew.Chem. 90, 50 (1978); Angew.Chem.Int.Ed.Engl. 17, 48 (1978); M.T.Reetz and K.Schwellnus, Tetrahedron Lett. 1978, 1455; T.H.Chan, I.Paterson and J.Pinsonnault, Tetrahedron Lett. 1977, 4183.
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