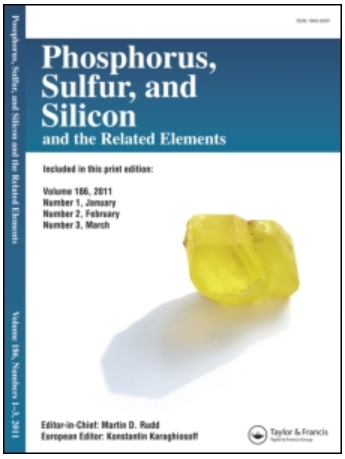

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Dithiophosphorylation of Cyclic Monoterpenes

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Dithiophosphorylation of Cyclic Monoterpenes

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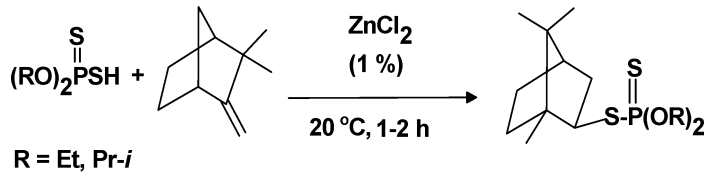
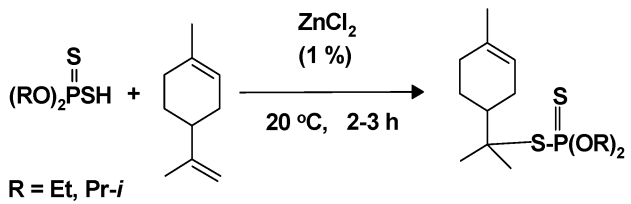
New data are presented for the synthesizing terpene esters of dithiophosphoric acids and their structure.

Keywords Cyclic monoterpenes; Lewis acid cataysts; thiophosphorylation

We have carried out the reactions of dithiophosphoric acids with such terpenes as racemic camphene, (+)-limonene, (1S)-(−)-β-pinene and 3-carene under mild conditions. These reactions occur at 20°C for 1–3 h in





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the presence of catalytic amounts of anhydrous $ZnCl_2$ to yield adducts formed in accordance with Markovnikow's rule. In the case of camphene the adduct formation is accompanied by skeleton transformation into norbornane structure. The reactions O,O-dialkyl dithiophosphoric acids with (+)-limonene proceed with the participation of the exocyclic C=C bond.

The reactions studied are facilitated by Lewis acid catayst ($NiCl_2$, CuCl, $CuCl_2$, $FeCl_3$, BF_3Et_2O, $AlCl_3$). The reactions of O,O-dialkyl dithiophosphoric acids with (1S)-(-)-β-pinene can also be performed non-catalytically.

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