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FURAN DERIVATIVES OF GROUP VII ELEMENTS (REVIEW)

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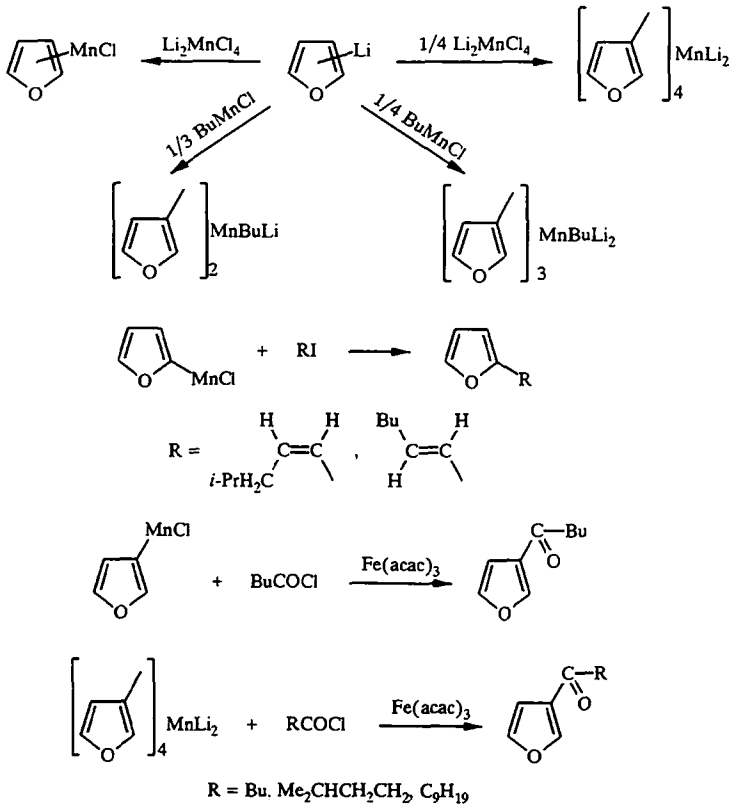
Methods for the synthesis of the furan derivatives of manganese and their chemical properties are reviewed.

Among the metals of group VII furan derivatives have only been obtained for manganese, and investigations in this region have been extremely limited [1-10]. 2-Furylmanganese [1] and 3-furylmanganese [2, 3] chlorides are obtained *in situ* from the corresponding lithium derivative of furan and Li_2MnCl_4 at −10°C (2-furylmanganese chloride) and −80°C (the 3-isomer) in tetrahydrofuran. With 3-furyllithium and Li_2MnCl_4 in a ratio of 4:1 dilithium tetra(3-furyl)manganate is formed. With butylmanganese chloride at −80°C in tetrahydrofuran 3-furyllithium gives lithium di(3-furyl)butylmanganate and dilithium tri(3-furyl)butylmanganate, depending on the ratio of the reagents [2]. These compounds react with iodoalkenes [1] and acid chlorides [2, 3]. The yields of the alkenylfurans and furyl ketones in this method are high and amount to 83-93%.



R = Bu, $Me_2CHCH_2CH_2$, C_9H_{19}

During treatment with sodiopentacarbonylmanganese the chlorine atom in pyromucic [4], 5-methylpyromucic [5], and 2-benzofurancarboxylic [5] acid chlorides is substituted readily and with a high yield by the pentacarbonylmanganese group. When the obtained compounds are heated at 70-100°C, decarbonylation occurs, and furylmanganese pentacarbonyls are formed.

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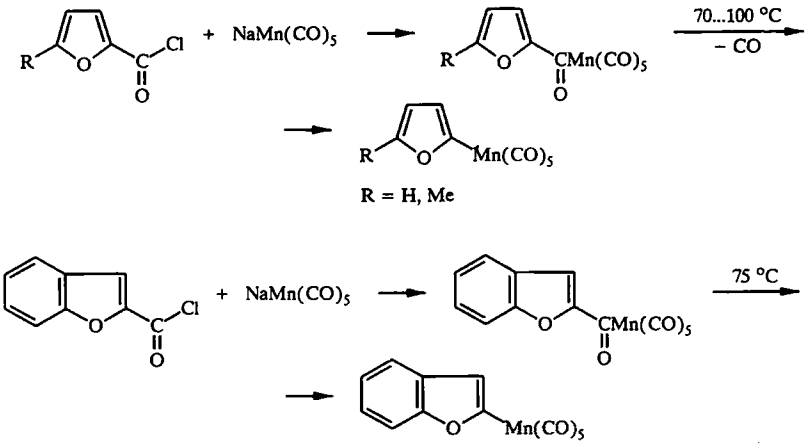
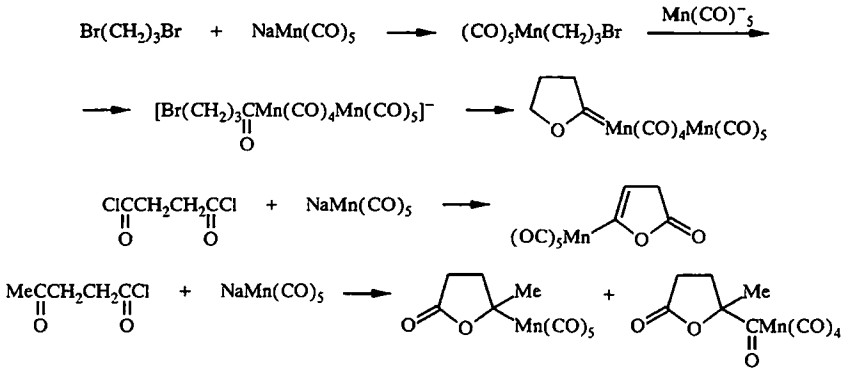
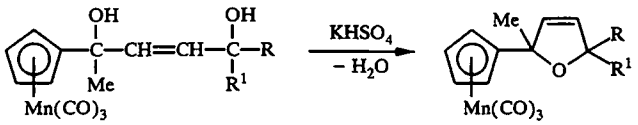


The cyclization of 1,3-dibromopropane [6], succinic dichloride [7], and γ-oxovaleryl chloride [8] by the action of sodiopentacarbonylmanganese was used for the synthesis of the tetrahydrofuran derivatives of manganese. The formation of a binuclear complex of manganese in the reaction with dibromopropane can be explained by attack of the $Mn(CO)_5^-$ anion on the intermediate alkylmanganese compound followed by ring closure [6].

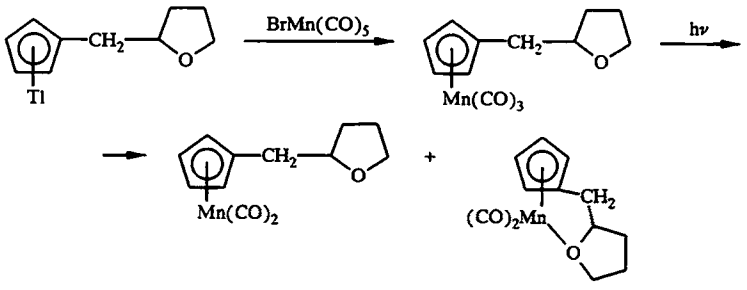


The cyclization of γ-oxovaleryl chloride gives a mixture of two lactones, one of which is the product from the insertion of the carbonyl group at the Mn—C σ bond [8].

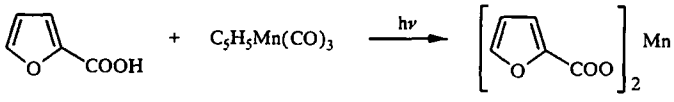
Cymanthrene-containing 2-butene-1,4-diols are easily dehydrated in the presence of dehydrating agents ($KHSO_4$) to derivatives of 2,5-dihydrofuran with the cymanthrene group at position 2 (yields 74-83%) [9].



The thallium atom in tetrahydrofurfurylcyclopentadienylthallium is substituted by manganese during the action of pentacarbonylmanganese bromide. According to the data from the matrix IR spectra, partial decarbonylation is observed during low-temperature photolysis of the obtained manganese complex at 77 K. This leads to the formation of two isomeric products, in one of which the manganese atom is coordinated with the oxygen of the furan ring [10]



Manganese difurancarboxylate was obtained with a 76% yield in the reaction of cyclopentadienyltricarbonylmanganese with pyromucic acid under UV irradiation [11].



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