



Tetra ammine copper (II) permanganate a mild and efficient reagent for oxidation of alcohol to corresponding carbonyl compound

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ABSTRACT

We wish to report Tetra ammine copper (II) dipermanganate for the oxidation of alcohol to carbonyl compounds. This reagent was prepared with $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, NH_3 and KMnO_4 . This reagent for oxidation of Primary and secondary benzylic alcohols is converted to their carbonyl compounds.

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KEYWORDS

Oxidation;
Alcohol;
Carbonyl compound;
Permanganate.

INTRODUCTION

Compounds of manganese (VII) are one of the most common factors for the oxidation of organic compounds. Manganese (VII) capacities are used as potassium permanganate. Oxidation of alcohols to carboxylic acids type I usually action is the use of potassium permanganate. The best yields are obtained when the permanganate and alcohol in anon-polar solvent using Catalyst phase transition, are together. When the reaction is complete aqueous solution of potassium salts of carboxylic acid with filtration MnO_2 precipitate are separated^[1].

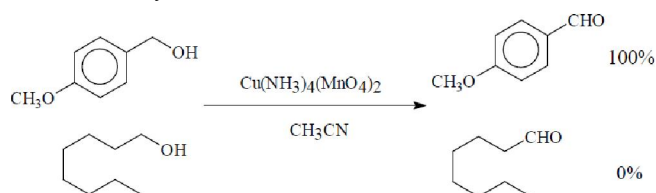
Copper-based antioxidant is one of oxidative reagent. These compounds over the years to resolve problems that arise when using it in their actions; such as solubility, lack of selectivity and extra oxidation, continually modified by chemists to use wider and better selectivity, as a good reagent by organic chemists accepted. Although efforts to resolve these problems by using different catalysts or reagents have been supportive, But still a lot of work to bed one in this field and opened new more horizons.

In this paper, we wish to report tetra ammine

copper bis (permanganate) ($[\text{Cu}(\text{NH}_3)_4](\text{MnO}_4)_2$; 1), was discovered by Klobb^[2]. M,ller et al.^[3] studied its IR spectrum and determined its powder diffractogram, but this diffractogram could not be indexed due to the presence of an unidentified contaminant. Gorbunov and Shmagin^[4] compared the ignition properties of 1 with other tetra ammine copper salts. An unidentified contaminant was also found in their samples. Seferiadis et al.^[5] reported the results of thermal studies and single-crystal structure determination of 1 and concluded that strong H-bonds are lacking in 1.

Tetra ammine copper II dipermanganate as a convenient, efficient and economical reagent for the oxidation of alcohol to carbonyl compounds. This reagent was prepared easily with $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, NH_3 and KMnO_4 . This compound stable and cheap oxidant to be used the oxidation of organic compounds aromatic at room temperature. With this Oxidant reaction efficiency is very high, the ratio of oxidation and yields to nature's materials. Equipment is simple in way^[6]. This combination of high selectivity for the oxidation of alcohols comprises and aromatic alcohols, aliphatic alcohol easily identify^[7].

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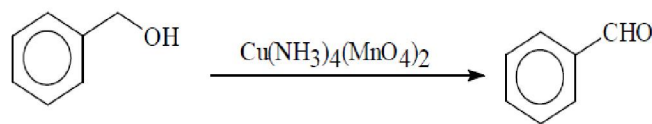
Ethyl acetate (4 : 1) and the solvent as evaporated to afford the desired product in excellent yield.

RESULTS AND DISCUSSION

Using this reagent per 1 mmol alcohol 0.37 g reagent (1 mmol) is needed. The reaction at the laboratory and in normal conditions and be done with an efficiency of 80-95%.

There is a heterogeneous system (two-phase). The product Separation is easily performed. Solids by filtration over the filter placed, pure product obtained by evaporating the solvent below filter.

The rate of oxidation and yield of product depended on the nature of the substrate and reaction condition. Oxidation of benzylic alcohols proceeded more rapidly

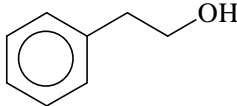
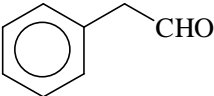
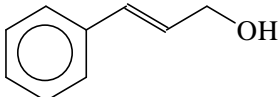
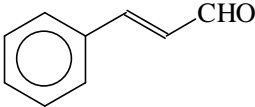
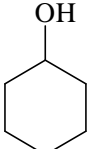
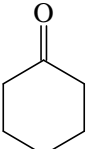
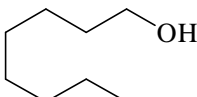
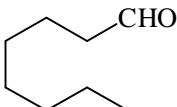
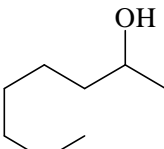
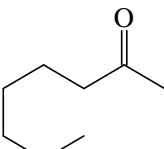


DESCRIPTION TESTS

Oxidation of alcohols tetra ammine copper (II) permanganate in acetonitrile and water

To a solution of alcohol (1 mmol) in CH_3CN (5 mL) or H_2O (5 mL) was added Tetra ammine copper (II) permanganate (0.37 g). The resulting mixture was stirred at room temperature. The progress of the reaction was monitored by TLC. After the completion of the reaction, silica gel (1 g) was added to the mixture and the solvent was evaporated under reduced pressure. The resulting material was added on silica gel pad (3 cm thick). The filter cake was washed with n-Hexane

Entry	Substrate	Product	Time(min) CH_3CN	Yield% CH_3CN	Time (min) H_2O	Yield % H_2O
1			20	90	30	95
2			10	92	25	90
3			120	85	150	80
4			8 h	50	10 h	45
5			80	95	120	95

Entry	Substrate	Product	Time(min) CH ₃ CN	Yield% CH ₃ CN	Time (min) H ₂ O	Yield % H ₂ O
6			50	87	60	85
7			160	90	200	90
8			No reaction		No reaction	
9			No reaction		No reaction	
10			No reaction		No reaction	

than the oxidation of aliphatic alcohols TABLE 1. In the oxidation of benzyl alcohols to benzaldehyde, when there is an electron releasing group, the rate and yield of the reaction increased. 4-Nitro benzyl alcohol is oxidized to its corresponding aldehyde within a longer time and 45-50% yield. Primary and secondary aliphatic alcohols are not oxidized to the corresponding carbonyl compounds under these conditions. Reaction in acetonitrile conditions is of a high yield and faster than reactions in water. The reactions are relatively clean with no tar formation and no over oxidation to carboxylic acids. The reaction of cinnamyl alcohol gave cinnamaldehyde with a high yield without cleavage of benzylic double bond.

Aliphatic alcohols are not converted to carbonyl compounds in the presence of the oxidant.

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REFERENCES

- [1] K.B.Wiberg; Oxidation in Organic Chemistry, Academic press: (1965); b) J.Muzart, J.Bull; Soc. Chim.Fr., 65, (1988); c) R.A.Sheldon, J.K.Kochi; Metal Catalyzed Oxidations of Organic Compounds, Academic press: New York, chapter 6, (1981); d) W.Herriott; Dipicker, Tetrahedron Lett, 1511, (1974); e) H.G.Lintz, K.Wittstock; Catal. Today, 457, 29 (1996); f) A.F.Restovic, J.L.Gautier, J.Braz; Chem.Soc., 223, 5 (1994); g) P. A.Wright, S.Natarajan, J.M.Thomas, P.L.Gai Boyes; Chem.Mater., 1053, 4 (1992); h) P.Porta, G.Moretti, M.Musicanti, A.Nardell; Solid State Ionics, 257, 63 (1993).
- [2] T.Klobb; Compt.Rend., 384, 103 (1886); Bull.Soc. Chim.Fr., 508, 3 (1890); b) K.Lasszlo et al; Helv.Chim.Acta., 2316, 85 (2002).
- [3] A.M.Iler, I.B^schen, E.J.Baran, P.J.Aymonino;

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- Monatsh.Chem., **836**, 104 (1973).
- [4] V.V.Gorbunov, L.F.Shmagin; Fiz.Goreniya i Vzryva, **523**, 8 (1972).
- [5] N.Seferiadis, E.Dubler, H.R.Oswald; Acta Crystallogr, Sect.C., **942**, 42 (1986).
- [6] T.Sala, M.V.Savgent; J.Chem.Soc.Comm., **253**, (1978); **b)** W.Reischi, E.Zbiral; Tetrahedron, **1109**, 35 (1979).
- [7] H.Firouzabadi, A.Sardarian; Synth.Comm., **863**, 13 (1983); **b)** H.Firozabad, B.M.Naderi; Tetrahedron Letts, **1987**, 23 (1982).