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ORIGINAL PAPER

An efficient method for the preparation of benzyl γ-ketohexanoates

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Twenty acid chlorides, 4-(mono/di-benzyloxy)-4-ketobutanoyl chlorides (*Ia–XXa*) were synthesised by the reaction of monoesters of succinic acid with thionyl chloride. The product thus obtained (4-benzyloxy-4-ketobutanoyl chlorides) was treated with diethylcadmium to convert it into the corresponding keto-esters (*Ib–XXb*), the mono/di-benzyl-γ-ketohexanoates, with a good yield. All the compounds thus prepared were characterised by physical, spectroscopic (UV-VIS, IR, ^{1}H NMR, ^{13}C NMR), and mass measurements techniques.

Keywords: γ-ketoesters, mono/disubstituted-benzyl alcohols, diethylcadmium, monoesters of succinic acid

Introduction

The γ-ketohexanoates are bi-functional compounds having ketone and ester groups. They are considered to be the precursors of numerous important compounds used in the pharmaceutical and agrochemical industries (Dahl et al., 1999; Forni et al., 1994; Fujisawa et al., 1994; Nakamura et al., 2003; Shafiee et al., 1998). These are synthons of some biologically active compounds like sex hormones and pheromones, anti-asthma drugs, enzyme inhibitors, additives in food, and perfumes (Hayakawa et al., 1998; Heiss et al., 2001; Itoh et al., 2002; Kataoka et al., 1999; Kizaki et al., 2001; Larock, 1999; Sheldon & Arends, 2004; Tojo & Fernández, 2006; Yamamoto et al., 2002a, 2002b). Hence, a number of techniques for their synthesis have been proposed and some significant routes leading to the synthesis of γ-ketoesters have been described by Ballini et al. (2002), Izquierdo et al. (2011), Wehrli and Chu (1973, 1978), Ronsheim et al. (2002), Brockman & Fabio (1957), and Taylor (1958). A great deal of work has been reported in this area of organic chemistry over the last decade (Bandgar et al., 2005; Csende, 2002; Hilgenkamp & Zercher, 2001; Huang et al., 2005; Kashima et al., 2001; Wang et al., 2009; Williams et al., 2001, 2002).

These methods require very expensive transition metal complexes, their ions or oxides as catalysts and toxic solvents such as ketoacids, strong inorganic acids, nitrogenous and halogenated solvents, the use of which can be harmful to the environment (Poliakoff et al., 2002; Larock, 1999; Sheldon & Arends, 2004; Tojo & Fernández, 2006; Bandgar et al., 2005; Csende, 2002; Hilgenkamp & Zercher, 2001; Kashima et al., 2001; Wang et al., 2009; Williams et al., 2001, 2002; Huang et al., 2005). The other common technique is anaerobic oxidation; this faces criticism on the grounds that it is difficult to control and to obtain a well-defined product (Csende et al., 1993; Stájer et al., 1994; Poliakoff et al., 2002; Hudlicky, 1990). However, the contribution made by Von Rudloff (1958), Cason (1942, 1946), and Cason and Prout (1944, 1948) to the synthesis of γ-ketoesters is essential as it provides basic and important information in this respect.

The above aspects prompted us to synthesise new mono/di-benzyl-γ-ketohexanoates (*Ib–XXb*) from the corresponding acid chlorides (*Ia–XXa*) using the methodology devised by Cason and Prout (1944, 1948) and Von Rudloff (1958). The compounds reported (*Ia–XXa* and *Ib–XXb*) were synthesised by following a two-step reaction using diethyl ether as solvent and diethyl cadmium as ethylating agent. In the first step, the benzyl hydrogen succinates (*I–XX*) were converted into the corresponding acid chlorides (*Ia–XXa*) by al-

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