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The C-H bond activation in 1-ethyl-3-methylimidazolium acetate-copper(ii) acetate-water-air (dioxygen) systems

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Abstract

Ionic liquid (1-ethyl-3-methylimidazolium acetate, [C2C 1im][AcO])-copper(ii) diacetate monohydrate-water-air (O2) systems have been investigated by 13C NMR, EPR, spectrophotometry, HPLC, and synthetic chemistry methods at different temperatures. The C-H bond activation of [C2C1im]+ with the formation of the unusual dication 1,1′-diethyl-3,-′-dimethyl-2,2′- biimidazolium ([(C2C1im)2]2+) at 50°C and 1-ethyl-3-methyl-1H-imidazol-2(3H)-one (C2C 1imO) at 50-85°C was revealed. Two new complexes with the above compounds, [(C2C1im)2][Cu(AcO)4] and Cu2(AcO)4(C2C1imO)2, were isolated from the systems and characterized by X-ray structural analysis. Catalytic cycles with the participation of copper(ii) acetate and dioxygen and the production of [(C2C1im)2]2+ and C2C1imO have been proposed. The catalysis presumably includes the formation of the CuII(O2)CuII active centre with μ-η2:η2-peroxide bridging in analogy with tyrosinase and catechol oxidase activity.

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