SYNLETT
Spotlight 460

Cetylpyridinium Chloride

Compiled by Oksana Paley

Oksana Paley was born in Ukraine in 1990. She obtained her M.Sc. degree in analytical chemistry from the Uzhgorod National University, Ukraine, in 2011. She is currently working towards her Ph.D. at the Uzhgorod National University under the supervision of Dr. Yaroslav Studenyak. Her research interests focus on studying the formation of ionic associates of surfactants.

Chemical Faculty, Uzhgorod National University, Fedynets St. 53, 88000 Uzhgorod, Ukraine
E-mail: oksanapaley@mail.ru

Introduction

Cetylpyridinium chloride (CPC; IUPAC name: 1-hexadecylpyridinium chloride) is a cationic quaternary ammonium salt with a molar mass of 339.99 g/mol and a melting point of 77 °C (80–83 °C for its monohydrate form). These beige flakes are insoluble in acetone, acetic acid, and ethanol but can be solved in water.

CPC is commercially available and can be synthesized by the reaction of cetyl chloride with pyridine and by alkylation of pyridine with cetyl dichlorophosphate. If swallowed or inhaled, it is toxic, and it is irritating to the eyes, respiratory system, and skin. However, it is also an antiseptic that kills bacteria and other microorganisms. Therefore, it is effective in preventing dental plaque and in reducing gingivitis. CPC is widely used in industrial and commercial formulations, including disinfectants, cosmetics, and pharmaceuticals. Hence, its accurate determination is necessary.

CPC shows an inhibitory action on the corrosion of mild steel.

Abstracts

(A) Synthesis of Nanostructures
A facile method for the synthesis of Au@Pd nanostructures with controlled sizes and morphologies using gold nanospheres as seeds and CPC as a surfactant was reported. The use of CPC is critical to generate a Au@Pd nanostructure with a flower-like morphology. Palladium nanoparticles stabilized by polystyrene (PS)-co-poly(ethyleneoxide) (PEO) and cetylpyridinium chloride were shown to be a very good catalyst in Heck reactions and the heterocyclization of N-methylsulfonyl o-idoaniline with phenylacetylene to form substituted indoles.

(B) Cetylpyridinium–Acesulfame Complex
Novel complex compounds, which shown great antimicrobial activity and also can find potential application as feeding detergents, were synthesized from potassium acesulfame, saccharine, and cyclamate on CPC in non-aqueous media.
(C) Reactions with Complex Metal-Containing Anions

Li and co-workers constructed a Langmuir–Blodgett film from the complex of cetylpyridinium–cadmium(1,3-dithiole-2-thione-4,5-dithiolate), which was synthesized from 4,5-bis(benzylthio)-1,3-dithiole-2-thione, sodium methylate, cadmium chloride, and CPC at room temperature.16a CPC also reacts with beryllium- and cobalt-complex anions.16b,c

(D) Synthesis of Acyloins

Various acyloins were obtained in good yields and high regioselectivities by ketohydroxylation of 1-aryl-1-alcohols with H2O2, catalyzed by the 12-tungstophosphoric acid–cetylpyridinium chloride CO2– complex anions.16b,c

Novel compounds were designed by the reaction of CPC with drugs, CPWP, H2O2, and solvent. CPWP was synthesized by the action of beryllium- and environmentally benign catalytic system consisting of the epoxidation of alkenes was successfully catalyzed by a recyclable and environmentally benign catalytic system consisting of CPWP, H2O2 and solvent. CPWP was synthesized by the action of ble and environmentally benign catalytic system consisting of CPWP, H2O2 and solvent. CPWP was synthesized by the action of ble and environmentally benign catalytic system consisting of CPWP, H2O2 and solvent. CPWP was synthesized by the action of ble and environmentally benign catalytic system consisting of CPWP, H2O2 and solvent.

(E) Epoxidation of Alkenes

The epoxidation of alkenes was successfully catalyzed by a recyclable and environmentally benign catalytic system consisting of CPWP, H2O2, and solvent. CPWP was synthesized by the action of CPC on tungstophosphoric acid in a solution of hydrogen peroxide.18

(F) Modification of Drugs

Novel compounds were designed by the reaction of CPC with drugs, including aspirin,19a sulfathiazole,19b and tricosanol,19a to obtain synergistic effects of the two ionic components.

References


(3) Asadoorian, J.; Williams, K. B. J. Dent. Hyg. 2008, 82, 42.


