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Colorimetric determination of olanzapine *via* charge-transfer complexation with chloranilic acid

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Abstract

The charge-transfer complexation (CTC) formed between olanzapine and chloranilic acid have been studied and used as a sensitive colorimetric method for the determination of olanzapine.

Evidence for the formation of the CTC between chloranilic acid (CAA) and olanzapine (OLP) was established by spot tests and TLC. Method development was carried out through selection of analytical wavelength, optimization and validation studies. Physicochemical parameters such as energy of transition, transition dipole, oscillator frequency and ionization energies were estimated and related to the stability of the formed CT band. Thermodynamic properties of the CT band at four temperature levels were also estimated and their inter-relationship established.

The reaction was completed at room temperature within 10 min with the evidence of formation of purple-coloured solution with CAA that absorbed maximally at 520 nm. Linearity was obtained in the concentration range of 2–40 μg/mL for OLP ($r = 0.9977$) with a limit of detection of 1.57 μg/mL. Estimates of accuracies and precisions gave error values less than 2% for both intra- and inter-day assessments. The transition energies were of the order of 2.303 eV. The Gibbs energy varied with the temperature and room temperature values favoured formation of stable complexes. The thermodynamic studies revealed small positive entropy for slightly negative enthalpy change.

The method was successfully applied to estimate OLP in tablets and the method was found to be of equivalent accuracy with the Indian Pharmacopoeia's HPLC method ($p > 0.05$). The method could find application as a rapid and sensitive determination technique for olanzapine.

Keywords: Olanzapine; Chloranilic acid; Charge-transfer complexation; Colorimetric analysis; Physico-chemical studies; Thermodynamic studies

1. Introduction

Olanzapine (OLP), with chemical name 2-methyl-4-(4-methyl-1-piperazynyl) 10H-thieno-[2,3-b][1,5]benzodiazepine is a thienobenzodiazepine derivative (Fig. 1). It was first synthesized by Eli-lilly, UK in 1982. The FDA, approved olanzapine sold by Eli-lilly under the trademark Zyprexa® in late 1996 [1]. Olanzapine is used in the treatment of mental illness in adults and teenagers

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