

Stability-indicating High-Performance Liquid Chromatographic Assay Method and Photostability of Carprofen

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Abstract

A rapid, sensitive, and accurate stability-indicating high-performance liquid chromatographic assay method for determining the degradation of carprofen (CPF) is developed and validated under acidic, basic, or photo-irradiated conditions. The analysis is monitored with a Cosmosil 5C18-AR column using a mobile phase of CH₃CN-H₂O-AcOH (50:49:1, v/v/v) at 260 nm. The developed method satisfies the system suitability criteria, peak integrity, and resolution among the parent drug and its degradation products. The results indicate that the established assay method shows good selectivity and specificity suitable for stability measurements of CPF. CPF is found to be more sensitive to exposure to light and in acidic conditions, but it is stable in a basic medium. The kinetic study of the photodegradation of CPF follows an apparent first-order reaction in a variety of solvents. The solvent effects on the rates of degradation are in the decreasing order of chloroform > dichloromethane > methanol > ethanol > 2-propanol, which is irrelevant to the dielectric constant epsilon. However, the hydrogen-donating ability of the solvents is essential to the photochemical decomposition of CPF. A plot of log k versus the Kirkwood function exhibits a linear relationship in aqueous ethanolic solutions, which implies that degradation proceeds via an ionic mechanism.