QUANTITATIVE ANALYSIS OF IBUPROFEN IN PHARMACEUTICAL FORMULATIONS THROUGH FTIR SPECTROSCOPY

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Abstract. **The quantification of ibuprofen through infrared spectroscopy was developed and validated for pharmaceuticals in tablet form. The method involves the extraction of the active ingredient with chloroform and the measurement of the area of the infrared band corresponding to the carbonyl group centered at 1721.5 cm^{-1}. The specificity, linearity, detection limits, precision and accuracy of the calibration curve, ibuprofen extraction, infrared analysis and data manipulation were determined in order to validate the method. Moreover, the statistical results were compared with the quantification of ibuprofen through UV detection.**

The recovery values obtained in the analysis of pharmaceuticals are within the 98-110 % range.

Keywords**. Ibuprofen quantification, FTIR analysis, UV analysis, pharmaceuticals.**

I. INTRODUCTION

Ibuprofen [(+/-) 2-(*p*-isobutylphenil propanoic acid, $(CH_3)_2CHCH_2C_6H_4CH_3CHCO_2H$] is well known as a non-steroidal anti-inflammatory (NSAID), analgesic and antipyretic agent (Adams *et al.*, 1969). This pharmaceutical is the active ingredient of a variety of oral medicines in tablets, gel pellets and syrup forms that are used worldwide due to the higher efficiency and tolerance, lower adverse effects and toxicity than other substances such as, aspirin, indomethacin and pirazolonic derivatives (Gasco López *et al.*, 1999).

The literature shows a variety of methods (approved and non-approved by health government agencies) to analyze raw ibuprofen (IBU for brevity) and pharmaceutical preparations, such as: direct titration with sodium hydroxide in methanol, potentiometric titration, high performance liquid chromatography, UV spectroscopy and flow injection infrared analysis. More recently, capillary electrophoresis and isotachophoresis have also been used to analyze ibuprofen and other NSAID pharmaceuticals (Sádecká *et al.*, 2001; Veraart *et al.*, 1998; Cherkaoui and Veuthey, 2000; Fanali, 2000; Donato *et al.*, 1994; Persson-Stubberud and Astrom, 1998).

The direct titration with sodium hydroxide is economical, easily applicable and is described in the European Pharmacopoeia for the quantification of raw IBU (Pharmacopèe Europèenne, 2002). However, colored or non-soluble excipients contained in tablets might interfere in the observation of the completion of the reaction through a chemical acid-base indicator.

Potentiometric titrations avoid the interference of the excipients since the completion of the reaction is detected through the slope change of the electromotive force emf (or pH) versus volume of titrant. This method is suitable to analyze raw IBU and tablets using tetrabutylammonium in acetonitrile (ANMAT monograph, 2003; Cakirer *et al.*, 1999).

The analysis of IBU through high performance liquid chromatography is used worldwide for quality control of pharmaceuticals. This method allows to analyze both IBU and products of degradation such as, 4-isobutylacetophenone (Pharmacopèe Europèenne, 2002; ANMAT monograph, 2003; Ravisankar *et al.*, 1998; Lampert and Stewart, 1990; US Pharmacopoeia, 2002). However, the pretreatment of the sample might be difficult if the excipients or the active ingredient are non-soluble in the mobile phase.

Capillary electrophoresis and isotachophoresis are economic, easily applicable and accurate methods to analyze IBU (Donato *et al.*, 1994; Persson-Stubberud and Astrom, 1998). Moreover, non-ionic species such as those involves in the excipients, do not interfere in the analysis. However, the technique requires qualified technicians and is not accepted by the government agencies (Sádecká *et al.*, 2001).

Although, infrared spectroscopy is the method described by the pharmacopoeias to identify IBU, the literature shows only one investigation concerning the quantification of IBU through IR (Pharmacopèe Europèenne, 2002; ANMAT monograph,