SURFACE ENHANCED SPECTROSCOPY OF AN ANTIINFLAMMATORY DRUG PIROXICAM.

R.de Llanos¹, P. Sevilla², S. Sánchez-Cortés¹, J.V. García-Ramos¹.

¹Instituto de Estructura de la Materia, CSIC, Serrano 121, 28006, SPAIN, roaqueldellanos@iem.cfmac.csic.es
²Departamento de Química Física II Facultad de Farmacia, Universidad Complutense de Madrid, Plaza de Ramón y Cajal s/n, 28040, SPAIN.

Piroxicam(4-hydroxyl-2-methyl-N-2-pyridinyl-2H-1,2,-benzothiazine-3-carboxamide1,1-dioxide) is a nonsteroidal anti-inflammatory drug (NSAID) which inhibits cyclooxygenase 1 and cyclooxygenase 2 (COX-1 and COX-2). While inhibition of COX-2 is the responsible of antiinflammatory effects, inhibition of COX-1 can produce gastrointestinal side effects and serious skin reactions [1]. This is the reason why the European Medicines Agency has recommended restrictions on the use of piroxicam containing medicinal products. These side effects could be related with piroxicam polymorphism and its poor water solubility which can be overcome by complexation of piroxicam with metals and also with cyclodextrins [2-3].

Nowadays noble metal nanoparticles, like silver and gold, are being widely used in drug delivery [4-5]. These metals have localized surface plasmons (LSP) which gives raise to surface enhanced spectroscopies, like SERS (Surface Enhanced Raman) and SEF (Surface Enhanced Fluorescence).

Both aspects can come together to improve the effectiveness of drug bioavailability.

![Figure 1. Piroxicam polymorphism.](image)

The aim of this work is to study, by spectroscopic methods, piroxicam and its complex with β-cyclodextrins over silver and gold colloids which are highly biocompatible, can improve water solubility of this drug and have also plasmonic properties which allow piroxicam SERS and SEF studies. The first SERS experiments, at different pH, show that only the zwitterionic form is SERS active. From SERS spectra and changes observed while pH is lowered, we deduced that an ion pair is formed.
between chloride anion adsorbed on the metal surface and the positively charged nitrogen atom of piridinium cation in zwitterion.


Acknowledgment: This work has been financially supported by projects: FIS2007-63065 from the Spanish Ministerio de Educación y Ciencia, S-0505/TIC/0190 from Comunidad Autónoma de Madrid and Research group 950247 from the UCM support. R. de Llanos acknowledges Ministerio de Ciencia e Innovación for a FPI fellowship.