

P4: Cyclic voltammetry of arylferrocenes and ferrocene analogues of chalcones. substituent effects on the electron density distribution in ferrocene derivatives

O. RAHIM*, A. DOUADI, T. LANEZ .

LVPRS, Université de Ouargla, 30000 Ouargla, Algeria

* B.P. 714 Ouargla

z.ramdan@gmail.com

Abstract:

Cyclic voltammetry studies of arylferrocenes and two series of ferrocene analogues of chalcone are presented. Good correlations of the oxidation potentials ($E_{1/2}$) with the (σ_p) Hammett constants as well as with the ^{13}C chemical shifts for carbon atoms with different positions in the ferrocenyl moiety have been found. The different sensitivities of these series to the substituent effects is discussed. The variation of the electron density distribution at the carbon atoms of the cyclopentadienyl rings is given numerically as a function of the electron-donating or electron withdrawing strengths of the substituents. Their anodic behavior was studied by cyclic voltammetry at a Pt electrode in aprotic solvent. All synthesized ferrocenes exhibited a one-electron reversible oxidation leading to the corresponding ferricinium cation. At low potential scan, the irreversible oxidation of the previous compounds.

The advantageous properties of the Cp* ligand - intensified electron donation, steric bulk, and enhanced solubility in comparison to the ubiquitous Cp ligand - are finding increasing use in organometallic chemistry. A systematic evaluation of synthetic routes to pentamethyl ferrocene compounds with a wide range of functionalities, including carboxyl, carbonyl, aminomethyl, vinyl, ethynyl, fulvenyl, cyclopentadienylmethyl, and others is reported. Spectroscopic, structural, and electrochemical properties of such functionalized pentamethylferrocenes $\text{Fc}^*/2\text{-R}$ are compared to those of non-methylated ferrocenes Fc-R .

Key words: Cyclic voltammetry, Ferrocene analogues, Cp* ligand, Pt electrode - aprotic solvent, Anodic behaviour, Interfacial.

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