Tuning the molecular/electronic structure of new substituted pyrazoles: Synthesis, biological trials, theoretical approaches and Hammett correlations

Bustos C.

Alvarez-Thon L.

Molins E.

Moreno-Villoslada I.

Vallejos-Contreras G.

Sánchez C.

Zarate X.

Mac-Leod Carey D.

Schott E.

The high yield synthesis, characterization and biological trials of a family of compounds containing the pyrazole core (E)-3,5-dimethyl-1-(4-R-phenyl)-4-(phenyldiazenyl)-1H-pyrazoles (with R = 4-CH3O (1), 4-CH3 (2), 4-H (3), 4-F (4), 4-Cl (5), 4-CF3 (6), 4-CN (7), 4-NO2 (8), 3-Cl (9), 3-NO2 (10), 2-Cl (11) and ?C6F5 (12)) are reported. Hammett correlations were found for the experimental and theoretical computed data, showing the dependence of all the obtained results on the donor or acceptor nature of the R substituent. In this sense, the absorption wavelength does decrease as the electron-withdrawing character of the substituent increases. Furthermore, the wavelength intensity does follow a Hammett correlation with the sigma donor character of the substituents. The compounds were characterized using MP, EA, UV?vis, FT-IR, 1H NMR, 13C NMR including bidimensional NMR experiments (HMBC and HMQC). The structures of 4, 5 and 8 were successfully elucidated by means of X-Ray diffraction. Pyrazole based dyes are known in pharmacological areas. Therefore, biological activity of all these structures were tested against cancer cell lines over a wide library of cell lines (60), including leukemia, colon and brain cancer, showing that the compounds have anticancer activity, which expands the knowledge of this kind of dyes as targets for this critical application. Finally, quantum calculations were carried out in order to

give a rational explanation to the observed UV?vis absorption bands and FT-IR signals. As shown, it is possible to tune the molecular/electronic structure of the synthesized dyes by means of changing the ?R substituent in the structure. © 2018 Elsevier B.V.

Anticancer activity

DFT

Hammett correlation

Pyrazoles

Synthesis

Bioactivity

Cell culture

Diseases

Nuclear magnetic resonance spectroscopy

Synthesis (chemical)

Absorption wavelengths

Anticancer activities

Critical applications

Hammett correlation

High yield synthesis

Pyrazoles

Substituted pyrazoles

Theoretical approach

Brain