



Model Chemistries of Hydrazides V. Bio-physico-chemical parameters derived from SEMO Computational Quantum Chemical (CQC-SEMO) studies of mono substituted INH

K. Somasekhara Rao¹, K. Ramadevi² and R. Sambasiva Rao^{3*}

1. Dept. of Chemistry, Acharya Nagarjuna Univ., Dr. M.R.Appa Rao Campus, Nuzvid-521 201, **INDIA**

2. PG Department of Chemistry, Sir C.R. Reddy College for Women, Eluru-534001, **INDIA**

3. Department of Chemistry, Andhra University, Visakhapatnam 530 003, **INDIA**

Email: sraokaza1947@gmail.com, rsr.chem@gmail.com

Accepted on 10th January, 2024

ABSTRACT

The effect of substituents on the electronic structure and physicochemical/biochemical properties of isonicotinic acid hydrazide (INH), an antitubercular drug is studied in gas phase at SEMO level. The quantum chemical computations are performed using PM3 Hamiltonian with AMPAC 6.7 software package, which accepts the chemical structure of a molecule through Graphics User Interface (Agui). The substituents attached to the pyridine ring of INH investigated are halogens (F, Cl, Br, I), fluoromethane (CH₂F, CHF₂, CF₃), groups like CH₃, NH₂, OMe- and CN-. The stability of INH based on total electronic energy and heat of formation (HoF) in gas phase substantially increases with the halogen atom or increases with the number of F atoms in fluoro methane group. Both electron pushing and pulling groups enhance the static dipole moment and linear polarizability of INH. The electron withdrawing NO₂ in INH results in a maximum dipole moment of 4.4 Debye. The second order non-linear hyperpolarizability (β , γ) is enhanced by two to three fold with iodo substituent rendering it to be a non-linear-optic (NLO) material. The log of octanol partition coefficient reflecting hydrophobicity increases by changing the substituent from F to I or with di- or tri-fluoro methane group. 2-Amino INH has greater hydrophilic function compared to even unsubstituted compound. The results of SEMO procedures offer complimentary /supplementary/additional information in probing into contradictory trends in physico-chemical/biological response of hydrazides.

Keywords: Isonicotinic acid hydrazide, SEMO, PM3-Hamiltonian, substituent effect, Polarizability, hydrophobicity, AMPAC-software, NLO-material
