

1.1 Five-Membered Heteroaromatic Hydrazone Derivatives for Second-Order Nonlinear Optics

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A series of novel five-membered heteroaromatic hydrazone derivatives was synthesized (Fig. 1). Their molecular hyperpolarizabilities μ and the dipole moments were experimentally determined by EFISH and dielectric measurements, respectively. A value of μ up to $370 \times 10^{-40} \text{ m}^4\text{V}^{-1}$ at $1.907 \mu\text{m}$ was obtained. We have shown for the first time that the furan derived π -conjugated core can become the most effective π -conjugated bridge in enhancing the molecular hyperpolarizability when compared with the corresponding phenyl and thienyl counterparts if an appropriate electron donor and acceptor are used.

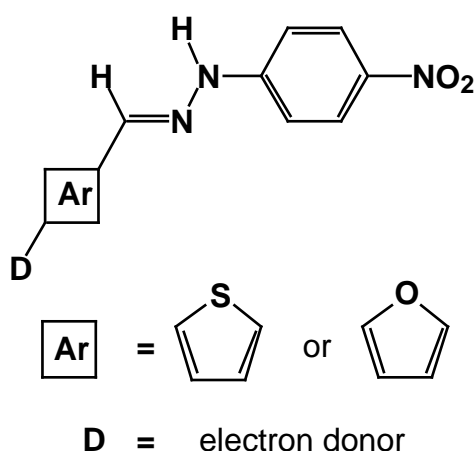


Fig. 1 Molecular structure of the five-membered heteroaromatic hydrazone derivatives.

Furthermore, one of these newly developed hydrazones, 5-(methylthio)thiophene-carboxaldehyde-4-nitrophenylhydrazone, MTTNPH is a potentially efficient crystalline material for frequency conversion applications because of the relatively large molecular hyperpolarizability component μ and the favourable orientation of this component in the crystal lattice.