# COVALENTLY COUPLED MULTI-DMABI HROMOPHORES: SYNTHESIS, LINEAR AND NONLINEAR OPTICAL PROPERTIES

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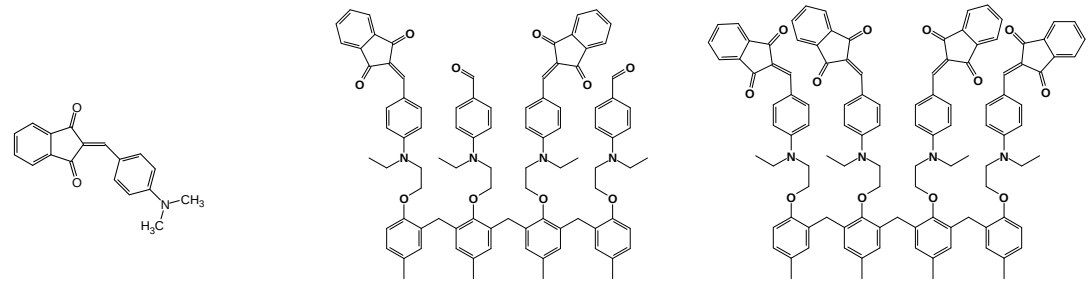
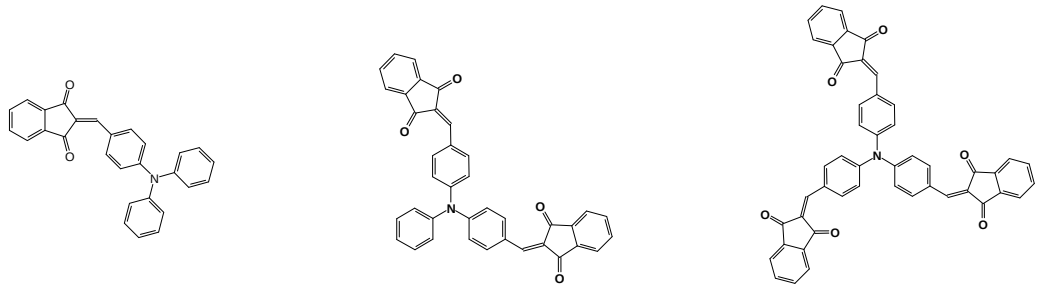
Over last two decades there is a stable interest to make use of organic molecular materials in a wide variety of nonlinear optical (NLO) applications [1]. Typically search for such material is based on development of chromophore with large first hyperpolarizability β. At the same time extent of material overall NLO efficiency is very much dependent on spatial arrangement of chromophores - they should be acentrically aligned and number density of them should be as high as possible. Unfortunately these two prerequisites are contradicting - molecules with large β possess a high dipole moment and tend to aggregate in cetrosymetrical, NLO inactive, structures. The DMABI chromophore (see figure), which possesses remarkably high NLO activity [2] and all optical poling capability [3] is in a scope of our research for many years. In spite of moderate dipole moment aggregation of DMABI strongly influence linear and nonlinear optical properties of host / guest polymer films [2,4]. To increase number density of active chromophores one could try to covalently bind them together in such a way that centrosymmetrical aggregation of individual chromophores are ruled out. Forming of such multiple chromophores could yield in formation of dipolar, octupolar or mixed NLO active molecular structures. Within this investigation multi-DMABI chromophore molecules (see figure) have been synthesized and studied by means of quantum chemical calculations, absorbance and fluorescence spectroscopy and hyper Rayleigh scattering (HRS) techniques.



DMABI | MtetraP-diDMABI | MtetraP-tetraDMABI



TPA-monoDMABI | TPA-diDMABI | TPA-triDMABI

Figure 1. Structures of investigated compaunds

[1] L. R. Dalton, J. Phys.: Condens. Matter 15, R897–R934, (2003)
[2] M.A.Rutkis, A.Vembris, V.Zauls, A.Tokmakovs, E.Fonavs, SPIE Proceedings, Vol, 6192, 6192Q, 2006
[3] A.Vembris, A.Apostoluk, M.Rutkis, A.Tokmakov, I.Muzikante, S.Dabos-Seignon, J-M.Nunzi, SPIE Proceedings, Vol. 5946, 2005
[4] S.Jursenas, N.Kurilcik, R.Karpicz, V.Gulbinas, L.Valkunas, M.Rutkis, I.Muzikante, Thin Solid Films, 2007, doi:10.1016/j.tsf.2007.11.066