

Recently, novel quinone compounds with extended conjugate system were designed and synthesized as electron transporting compound for fabricating single-layer organic photoreceptors (OPC) useful for positive charging.⁽²⁾

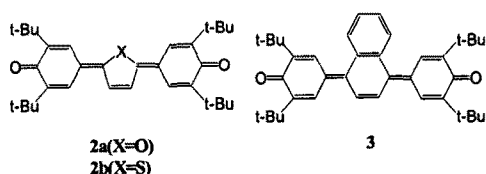
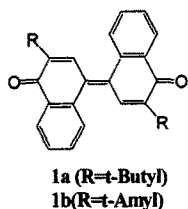


Fig. 2. Quinone Compound with Extended π -Conjugate system.⁽²⁾

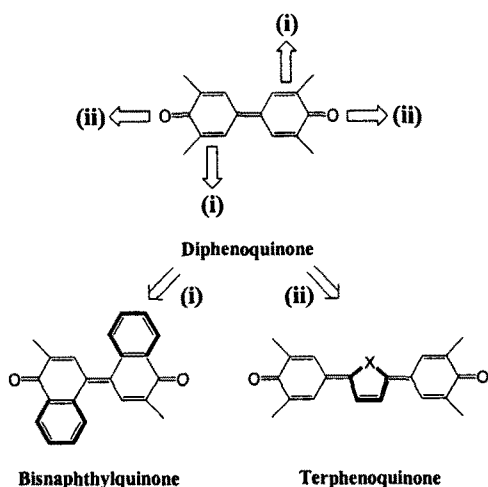


Fig. 3. Molecular design Concept.⁽³⁾

The structural features of extendedly conjugated molecules developed by Yokoyama group were following as

- a) Substituted naphthyl group in place of phenyl group : vertical extension of conjugated system.
- b) Introduced hetero ring between aromatic

group : horizon extension of conjugated system.

The feature of them is extended in intramolecularly conjugated system without functional group.⁽³⁾

Herein, we designed, synthesized and measured new type quinone molecules of intramolecularly conjugated system with functional group at first time so far as we know.

2. Molecular Design

Electron transporting compound in this study were designed on the basis of the following concepts.

- a) Taking a suitable electron accepting property.
- b) Extending intramolecularly conjugated system with function group.
- c) Good compatibility to a binder polymer

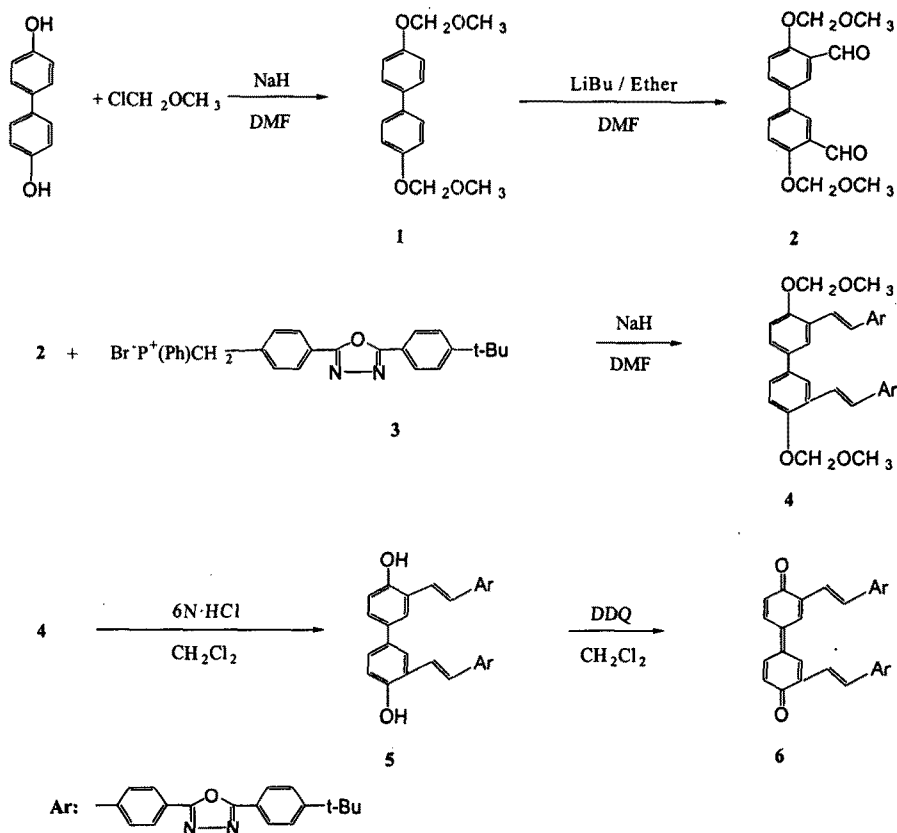
In Scheme 1, new type quinone compounds designed on the basis of the above concepts are shown.

3. Experimental

Synthesis : All starting materials were purchased from Aldrich and used without purification. Biphenol with formyl group was synthesized by two-step and oxadiazole compound was prepared using a method similar to that in ref. 4,5.

Absorption and Photoluminescence : Photoluminescence spectroscopy a method for investigating the relaxed excited states.

The absorption and photoluminescence spectra of the diphenylquinone with conjugated oxadiazole derivative CHCl_3 is shown at Fig. 4. The maximum peak of the absorption spectrum appears at 330 nm, while the photoluminescence peak occurs at 420 nm. Both spectra are mirror images of each other. The diphenylquinone with conjugated oxadiazole derivative shows a large photoluminescence peak due to the characteristics of excimers form excited states to ground states, which indicates the excellent exciton-generation ability. When we think



Scheme 1

of a potential energy diagram for a pair of molecules, molecular approach increases the resonance energy, and the photoluminescence spectra can be measured over a longer wavelength region than the absorption spectrum

Evaluation of Redox Potentials : Redox potential (vs. Ag/Ag^+ , silver nitrate) as an evaluation of the electron acceptance was measured with cyclic voltammetry (WonA Tech. Co. Korea) a dichloromethane solution incorporated with tetra-butyl-ammonium perchlorate at a sweep rate of 10mV/s.

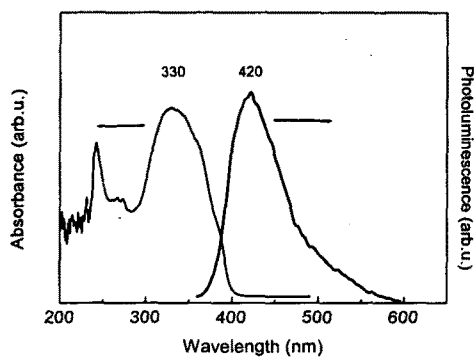


Fig. 4. UV/Vis and Photoluminescence of a solution diphenoquinone with conjugated oxadiazole derivative. The solution used is chloroform. Both spectra were measured on the same concentration of 3×10^{-4} (mol/L).

Electron Drift Mobility by Time of Flight(TOF) : The electron drift mobility measurements were made by conventional time-of-flight (TOF) technique. The film (about 5 μ m thick) for this measurement was prepared by dissolving mixtures of the appropriate quinone compound and PC-Z in dichloromethane. And then spin-coating the resulting solutions onto ITO glass followed by drying at 60°C for 1hr, and semi-transparent gold electrode was then vacuum-deposited onto the layer. Photoexcitation was carried out by 3-ns exposure of 337-nm radiation derived from N₂ laser. The mobility μ was calculated from the conventional expression $\mu = L^2 / \tau \cdot V$, where L is the film thickness, τ transit time and V the applied voltage.

References

- [1] Y. Yamaguchi, H. Tanaka, M. Yokoyama, "J. Chem. Soc. Chem. Commun", Vol. 222, (1990)
- [2] H. Okada, F. Sugai, Y. Mizuta, M. Yokoyama, "PPIC/JH '98", p. 207, (1989)
- [3] H. Okada, F. Sugai, E. Miyamoto, H. Iwasaki, M. Yokoyama, "IS&T'sNIP16", p. 457, (2000)
- [4] H. C. Zhang, W. S. Huang, L. Pu, J. Org. Chem, Vol. 66, pp.481-487, (2001)
- [5] Arno. Kraf, "Liebig's Ann. / Recueil", pp. 1463-1471. (1997)