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学 位 （ 博 士 ） 論 文 要 旨
(Doctoral thesis abstract)

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主指導教員 氏　名 Chief Advisor's Name	荻野賢司	副指導教員 氏　名 Vice Advisor's Name		副指導教員 氏　名 Vice Advisor's Name	
論文題目 Title	Synthesis and Application of Electron Transporting Polymer for Electroluminescent and Photorefractive Applications (電界発光及びフォトリフラクティブ材料への展開を指向した電子輸送性高分子の合成と評価)				

論文要旨（和文要旨(2000 字程度)または英文要旨(500words)）
※欧文・和文どちらでもよい。但し、和文の場合は英訳を付すこと。
Write a summary in Japanese (2000 characters) or in English (500words).
If the abstract is written in Japanese, needed to translate into English.

Organic semiconductors have been applied to electrophotography, laser printers and electroluminescent display. There are still problems to be solved for improve the performance of electrophotography, electroluminescent, and photorefractive devices. It is necessary to develop electron transporting polymers with high transparency, and high electron mobility. For electroluminescent applications, simple synthetic strategies are desired from the practical point of view.

In this study, the author focused on the development of electron transporting polymers with high transparency based on thioxanthene moiety, and photorefractive application The author also tried to develop electron transporting polymers with hole transporting and luminescent ability via simple synthetic strategies.

In Chapter 1, a mechanism of charge transporting in organic materials is introduced, and then electron transporting materials with low molecular mass ever reported for electrophotography and electroluminescent applications are shortly reviewed. Polymeric electron transporting materials are also introduced. Electron transporting and fluorescent polyfluorene has been used as an active layer and chemically modified to improve the performance. The objectives are described accompanied with the problems to be solved.

In Chapter 2, novel electron transporting polymers were prepared from acrylate or methacrylate having thioxanthene derivative. Resulting polymers were soluble in common organic solvents such as THF and DMF, and showed electrochemical activity. Drift mobility measurements and molecular orbital calculations revealed that well-balanced electron distribution in LUMO in electron transporting molecule plays an important role for high electron drift mobility. Photoinduced surface potential discharge curve showed that prepared polymers can be applied to organic photoconductor device.

In Chapter 3, polymers containing TPD and oxadiazole or anthracene units were prepared by Friedel–Crafts reaction. Polymerization between BTPD and BCA units occurred in the presence of 4.0 mol % of catalyst. On the other hand, it was necessary to use more than 150 mol % of catalyst to react BTPD with BCO. The low reactivity of BCO polymer was explained by the presence of oxygen atom in oxadiazole unit, which reacts as a base and reduces the catalytic activity. The polymerization occurred not only at the para-position of the phenyl group but also at the meta-position of the butylphenyl group. From the results of CV, the BTPD-BCO showed not only the oxidation but also a reduction peak. It can be assumed that introduction of the BCO improved the electron withdrawing ability of the polymer. The hole and electron drift mobility were measured by the standard time-of-flight method. BTPD-BCO showed an excellent charge balance, and the electron mobility of the BTPD-BCO was 14 times higher than that of BTPD-BCA.

In Chapter 4, polymers containing fluorene and phenoxazine units were prepared by oxidative polymerization of DBP and PPX. With the increase of PPX unit oxidation potential of the polymer decreased. Hole mobility increased from 2.6×10^{-6} to 3.7×10^{-5} cm^2/Vs and electron mobility decreased from 7.3×10^{-5} to 1.6×10^{-5} cm^2/Vs as PPX content increased from 0% to 42%. EL device with the structure of ITO/Polymer/Ca/Al was fabricated. With polymer containing 30% of PPX units, the device showed best properties: maximum luminance of 1084 cd/m^2 and current efficiency of 0.30

cd/A.

In Chapter 5, poly (arylene ether) containing electron transporting thioxanthene unit in main chain was prepared and characterized. It was applied to the host polymer of PR composite. In this polymer electron donating ether oxygen atoms attach to thioxanthene moiety. Therefore, it is expected that the absorption coefficient decreases since the overall electron accepting nature of thioxanthene moiety can be suppressed. PR characteristics were investigated by two-beam coupling and four-wave mixing experiments.

In Chapter 6, general conclusions are described.

（英訳）※和文要旨の場合(300 words)

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