BILKENT UNIVERSITY

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FACULTY OF SCIENCE

MATERIALS SCIENCE and NANOTECHNOLOGY

GRADUATE PROGRAM SEMINAR

"Benzotriazole Containing Donor-Acceptor Type Polymer as a Multi-Purpose Material"

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Since the discovery of conducting polymers they became a fundamental research subject both in academia and industry. They have been used as active materials in numerous industrial applications namely, electrochromics, LEDs, solar cells, sensors and field effective transistors. Many different derivatives of conducting polymers were successfully prepared over the decades and their potential as advanced materials have been investigated for numerous applications. The use of conjugated polymers as active layers in electrochromic devices became more popular over the time due to their fast switching times, high optical contrasts, processibility, and easy tuning of color via structure alternations.

Another aspect that attracted the researchers towards the polymeric materials is; multicolors can be achieved with minor structural variations on the material. Multichromic polymers have become a major field of research due to their potential use in many different applications like display systems and smart windows.

One of the properties of conducting polymers is their great potential to be n-doped. However, the research on the n-doping characteristics of these materials resulted in a handful of materials exhibiting this unique property. The n-doped semiconducting polymers will have a great impact since it will open the way for the fabrication of light emitting diodes, bipolar transistors, and polymeric analogue of silicon field effective transistors.

Recently, benzothiadiazole or quinoxaline containing donor-acceptor polymers synthesized in our group led to the first neutral state green polymeric material with highly transsmisive oxidized state. These results have opened the way for utilization of electrochromic polymers in display devices. The remarkable behavior of donor-acceptor type polymers as active layers in electrochromic devices encouraged us for the synthesis of novel polymers containing alkylated benzotriazole as the acceptor unit. The donor-acceptor type polymers synthesized with benzotriazole and ethylenedioxythiophene units resulted in promising electrochromic materials, showing superior characteristics than PEDOT itself. This observation was remarkable since the benzotriazole unit enhanced the electrochromic properties of the homopolymer of the donor unit, PEDOT. These encouraging results led us to synthesize novel polymers bearing benzotriazole unit as the acceptor and polymerizable electron-rich aromatic units as the donor. Herein, we present results where thiophene is employed as the donor unit.

The resulting polymer has six distinct colors, which is a very rare and unique property for homopolymers.

The polymer was also shown to be both p and n-dopable by cyclic voltammetry and spectroelectrochemistry experiments. The optical constrasts and switching times of the polymer were greatly improved. In addition, the polymer is highly fluorescent which makes it a potential candidate for LED applications. Finally, the polymer is soluble in many different organic solvents with a strong absorption in the visible region which brings out the possible use of this material as an active layer in solar cells.

Date : March 19, 2010 (Friday)
Time : 15:40
Place : Faculty of Science Building, A Block, Seminar Room (SA 240)

Tea will be served after the seminar