# SPECTROSCOPIC STUDIES ON ELECTRONIC ENERGY TRANSFER OF BILAYER FILMS OF POLYSILANES

Hajiheidari, Dariush*
Jahad Daneshgahi, Isfahan university of technology
P.O.Box 84155-147, Isfahan, I.R.Iran
Kaito, Akira
National Institute of materials and chemical research, 1-1 Higashi, Tsukuba, Ibaraki 305-8565, Japan

**ABSTRACT**
Oriented films of poly (dimethylsilane) (PDMS) and poly (diethylsilane) (PDES) on smooth quartz plates were prepared by the friction deposition technique. The oriented film of poly (dihexylsilane) (PDHS) spin-cast from its n-hexane solution on the oriented film of PDMS. In the same way, the oriented film of soluble poly (methylpropylsilane) (PMPrS) spin-cast from its n-hexane solution on the oriented film of PDES. The bilayer films were studied with polarized UV absorption spectroscopy to confirm the molecular orientation and indicated that solution-cast films and friction-transferred films of polysilanes were oriented. The intermolecular energy transfer was studied in the bilayer films of polysilanes with polarized fluorescence spectroscopy. The results indicated that in bilayer films the energy transfer occurs from PDMS layer to PDHS layer and also from PMPrS layer to PDES layer.

*Key words:* Polysilane; orientation; energy transfer; friction deposition; spin cast

## Introduction

Polysilanes are the polymer containing only silicon in the main chain and having organic substituents. Polysilanes have received increasing attention because of their intriguing electronic and optical properties such as thermochromism, photoconductivity, luminescence, and photoresists. The unique properties of polysilanes originate from the delocalization of δ -electrons along the Si-backbone.

Many application of polysilanes have been examined. Their electrical conductivity, thermochromism, luminescence, photoconductivity, charge transport and nonlinear optics have been investigated [1-6]. The photoreactivity of polysilanes enables the polymers to be used for photoinitiators of polymerization and photoresists.

The δ -conjugated system of polysilanes also exhibits an efficient emission in the UV and near UV regions, which let us use them as the light-emitting device (LED)[7-10]. Polysilanes are not only used as a hole-transporting layer in the multilayered LED device but also applied to a single-layered LED device owing to their light-emissive and hole-transporting functions.

The possibility of intermolecular energy transfer has been studied using bicomponent materials consisting of polysilanes having different substituents [10-12]. The energy transfer distance between polysilane layers was examined by employing heteropolysilane Langmuir-Blodgett (LB) films. It was estimated that energy was transferred from a poly (alkylsilane) layer to a poly (arylsilane) layer through an insulator layer thinner than 2.2 nm. The fluorescence spectroscopy of the blends of polysilane was discussed in relation to the miscibility of the blends [13]. In a miscible blend, such as the PDHS/poly (methyl-n-propylsilylene) blend, energy is transferred from polysilane with a higher electronic energy to that with lower energy. The intermolecular energy transfer between PDHS and poly (diphenylsilylene) was examined in the

*to whom correspondence should be addressed
E-mail: dhajiheidari@yahoo.com