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P1. Surface Electric Potential of P(VDF-TrFE) Nanolayers under Influence of Ultraviolet Radiation

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Influence of ultraviolet (UV) radiation on surface electric potential of 20-25 nm thick P(VDF-TrFE 70:30) nanolayer consisting of 70% vinylidene fluoride (VDF) and 30% trifluoroethylene (TrFE) deposited on the glass substrate by Langmuir-Blodgett method was studied. P(VDF-TrFE) is a ferroelectric material that can change its polarization upon application of the external electric field. Hypothesis was proposed that the external electric field can be provided by the electric charges generated on the glass substrate during UV exposure. The amount of this charge can depend on time of UV exposure, therefore, the amount of change in P(VDF-TrFE) polarization will also depend on time of UV exposure. Polarization of P(VDF-TrFE) nanolayer can be evaluated indirectly by measuring surface electric potential of the nanolayer with Kelvin probe force microscopy (atomic force microscope – AFM).

Samples of bare glass substrate and P(VDF-TrFE) nanolayer deposited on the glass substrate were UV irradiated (250-400 nm, with the central wavelength 365 nm) with different exposure steps accumulating 60 min total time of UV exposure. Exposure steps 5, 12.5 and 20 min were used. Surface electric potential was measured after each step of the exposure. To ensure that surface electric potential is always measured on the same area of the samples, UV irradiation was done inside AFM. Control measurements without UV exposure were also made. In this case 5, 12.5 and 20 min were waiting intervals between AFM measurements accumulating 60 min total waiting time.

The results show that surface electric potential of both the glass substrate and P(VDF-TrFE) decrease under influence of UV exposure. The percentage of the decrease depends on irradiation step. Regardless of the irradiation step, surface electric potential of P(VDF-TrFE) stops decreasing after 30 min of total time of UV exposure which suggests that polarization of ferroelectric P(VDF-TrFE) reaches its saturation. Surface electric potential of P(VDF-TrFE) starts to relax to its initial value after UV radiation is switched off. Comparison with the control group of samples shows that Kelvin probe force microscopy measurements themselves slightly influence changes of surface electric potential of both glass and P(VDF-TrFE) samples.

The potential application of the effect is detection of UV radiation by ferroelectric P(VDF-TrFE) nanolayers deposited on glass substrates.

Keywords: *P(VDF-TrFE), atomic force microscopy, Kelvin probe force microscopy, surface electric potential, UV*

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