Investigation of Physico-Chemical Properties of Organic Materials for Creation of Thin Film Piroelectric Elements of Infrared Radiation Detectors

Boichuk V.I., Peleshchak R.M., Kravtsiv M.M.

Drohobych State Pedagogical University, Drohobych, Ukraine

The results of investigations of organic materials based on the films of poly-crystalline organic poly-cycle compounds, which are characterized by the non-symmetric crystalline structure and belong to the naftaline and dyphenile class, have been presented in the work. There are many dielectric materials to be known which possess electrical polarization at the absence of external electrical field. The organic semiconductors based on the thin film of poly-crystalline organic poly-cycle compounds have been chosen as objects for the research. The best piroelectric characteristics have been obtained for the films based on the dephynile class.

The samples have been prepared by vacuum thermal evaporation of organic matter on the dielectric substrates with further crystallization of the formed phase. The thickness and the parameters of film have been determined by the time and regime of the organic matter evaporation. The correct orientation has been obtained for 1 μm films.

The films of poly-crystalline organic poly-cycle compounds present themselves as ordering conglomerate of micro-crystals which possess microscopic spontaneous polarization toward normal of substrate, giving therefore piroelectric properties of the films [1]. The films morphology can be obtained under microscope in the view of many-centered spheroid structure, characterizing a statistical meaning of any crystallographic axes in the plane of substrate.

The films are characterized by the piroeffect which is explained by the strong temperature dependence of interrelated situation of polar groups in the organic molecules [2]. In respect to own parameters, the poly-crystalline films of organic compounds are similar with known piroelectrics.

The using of such films testifies on their perspective application as materials for creation of new type piroelectric detectors of infrared radiation.

1. Dorozhkin L.M., Lazarev V.V., Pleshkov G.M. Thin film piroelectric detector based on the organic compounds for measuring parameters of impulse laser radiation // Quantum electronics. – 1983. -V.10. – P.1107-1112.
2. Mykola Kravtsiv. On the mechanism of formation of the photoelectret state in 4-nitro-4′-aminodiphenyl thin films. // Materials Science.- 2014- Vol.20 - № 4. – P.69 – 75.