CHARACTERIZATION OF DOMESTIC MATERIALS FOR 3D PRINTING BY THERMAL AND SPECTRAL ANALYSIS METHODS

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3D-printing with polymer filaments has become an integral part of modern electrical engineering, especially in the field of creating housings and insulation elements. Traditional thermoplastics, such as polyethylene terephthalate, ABS, or polyamide-6, have excellent dielectric properties, which allows manufacturing reliable enclosures for electronic devices, terminal blocks, and fastening elements of complex geometry.

Domestic manufacturers have established production of 3D-printing materials from a wide range of polymers. However, technical specifications generally do not provide information on physical-chemical parameters important for their application. Moreover, the physical-chemical constants inherent in the base polymer do not always correspond to the filament based on it. Therefore, it seemed important to evaluate the properties of the most common 3D-printing materials using thermal and spectral analysis methods, and to compare the results obtained with data known from the literature.

Studies were carried out using IR-Fourier spectroscopy with attenuated total reflectance, thermogravimetric analysis, and differential scanning calorimetry. Data on phase transitions, thermal stability, and spectral characteristics were obtained for a large number of materials of different brands with polymer bases presented in the table:

Polymer Base of Investigated 3D Printing Materials

Polymer Base Type	Material Brand	Manufacturer
Polylactide	REC PLA	LLC «REC»
Polymethyl methacrylate	PMMA CAST	LLC «REC»
Polyether ether ketone	PEEK	LLC «REC»
Polysulfone	PSU	LLC «REC»
Polycarbonate	PC AVIA	LLC «REC»
Polyurethane	TPU Soft	Bestfilament
Polystyrene	HIPS	Bestfilament
Poly(acrylonitrile-styrene-acrylate)	ASA	Bestfilament
Poly(Acrylonitrile-butadiene-styrene)	ABS	Bestfilament
Polyethylene terephthalate, glycol-modified	PETG "Avatar"	«FDplast»
Polyamide-6	PA-6	Ecc Market