

## THERMOGRAVIMETRIC ANALYSIS OF P(VDF-TeFE)/nano-Si COMPOSITS WITH GAMMA RADIATION

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Initial and modified composites based on 1% and 12.7% silicon with polyvinylidene fluoride copolymer (P(VDF-TeFE)) with gamma irradiation have been studied by thermogravimetric analysis (TGA) method [1]. On the basis of analysis of the obtained results, the interaction between composite components has been studied.

The results obtained from the thermodynamic region of TGA spectra of composites presented in the table.

*Calculated parameters of P(VDF-TeFE)/nano-Si composites from TGA spectra*

Volume, %	D, kGy	M <sub>start</sub> , %	M <sub>final</sub> , %	T <sub>start</sub> , °C	T <sub>final</sub> , °C	Δm, %	ΔT, °C	v=Δm/ΔT, %/min.	Δm <sub>res</sub> , % (540°C)
0%	0	98	39.5	440	493	58.5	53	1.10	26.6
	0	95	31	465	497.2	64	32.2	1.99	32
	100	92.7	34.3	449.5	487	58.4	37.5	1.56	33.7
1%	300	92	40	434	480	52	46	1.13	40.5
	0	98	30	469	492	68	23	2.96	29
	100	98.6	37.8	441	479.7	60.8	38.7	1.56	35.9
12.7%	300	96	39	426.4	477.6	57	51.2	1.11	39.6

As shown in the table, for initial P (VDF-TeFE) thermal degradation starts at 440°C and continues to ~ 493°C. The polymer matrix loses most of its mass around this temperature. The results of the polymer and composites in the table indicate that the beginning of degradation of the composites is moving towards higher temperatures. This is an indication of the higher exploitability of composites. Gamma irradiation reduces the cleavage rate of composites ( $v = \Delta m / \Delta T$ ), increases the residual mass ( $\Delta m_{res}$ ) [1]. The changing parameters of irradiated composites related the crosslinking processes in the polymer and the structural changes in the composite, which related increased interphase interaction in the polymer-filler boundary.

The observed changes of after gamma radiation show improving of crystallization phase, mechanical and thermal properties of composite structures.

1. E.Mansfield // "Modeling, Characterization, and Production of Nanomaterials". 2015. P.167. <https://doi.org/10.1016/B978-1-78242-228-0.00006-5>.