It was shown that not only concentration and structural, physical, and chemical characteristics of the filler but also the conditions for the production of samples are important for the creation of nanocomposite material based on PE and MWCNTs.The degree and time of structural relaxation of nanocomposite FP–EG depend on the size of the filler particles: with an increase in the size from 40 to 260 um, the relaxation rate reduces by 25%; with an increase in concentration from 1 to 5 vol.The addition of carbon nanotubes in 4–5 vol.% to the polyethylene matrix allows to obtain not only the conductive composite but also to increase the stiffness of the material.The conditions of creation effect on the structuring of the matrix, which leads to stabilizing its characteristics and controlling the damping parameters of the material.% the relaxation time increases almost twice.