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Polyester geotextiles for landscape design

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Geotextile materials are more commonly used in road construction, though they are also often applied in landscape architecture design. Geotextiles are put inside various earthwork structures (terraces), slopes, declivities, drainage systems, etc. These materials prevent mixing of different material layers, strengthen loose ground, protect hydraulic systems from physical and mechanical destructions, restrain the growth of plants roots and weed germination. Inside the soil, geotextiles are affected by dampness, temperature changes, soil pH, vital activities of microorganisms and animals, they resist the pressure of layers with different fraction sizes.

Use of polyester fibers makes it possible to produce geotextile materials with certain wear resistance properties. Fibers are specified by good mechanical properties, though they can be hydrolyzable. So, it is necessary to determine soil pH. Taking into account that soil is a culture medium for microorganisms growth and their vital activities, it is essential to examine geotextiles resistance to bio destructors activity. Testing in natural environment was performed by digging non-woven textile fabrics into the active soil for 12 and 24 months.

Damage of fabrics integrity with plants roots was analysed after 12 and 24 months of load on the materials. Signs of microbiological destructions were found on the fibers (local thickening, cracking, horizontal splits). Damages characterized by thickening had recesses as well as swelling in some areas. These changes in polyester fibers macrostructure can be the result of microorganisms generation on certain areas. Culture media for active spread of micro destructors are dyes, saturating composites, that produce surface damages, which is partly loosened by microorganisms.

For non-saturated geotextile non-woven fabrics, having been in soil for 12 months, the number of mesophilic aerobic and optionally anaerobic microorganisms increased to 1.2×10^6 colony forming units per 1 gram, during 24 months they increased to 7.8×10^6 and to 7.9×10^8 colony forming units per 1 gram for materials saturated by acrylic polymer binders. In total, after testing in natural environment, the share of microbiological destruction by bacteria was 99.9%, and by fungi and yeasts – only 0.1%.

These signs of microbiological destruction do not crucially affect the indicative values of physical and mechanical properties of geotextile non-woven materials. Thus, after 12 months, the growth of critical durability by 3% over the length and by 20% over the width was observed. After 24 months, the critical durability of these materials reduced by 8% over the length, but there was the growth over the width due to the increase of surface density and thickness as a result of considerable colmatation with soil particles. Saturated geotextile non-woven material under study was characterized by the reduction of critical durability by 18% over the width. The value of relative stretching at the moment of tearing also decreased after 12 and 24 months of natural testing. The process of colmatation of geotextile non-woven materials also affects their porosity that, in its turn, depends on their nature, fibers location and fixation, thickness, surface density, and fibers processing. So, the largest value of the porosity of non-processed geotextile non-woven materials is 93.64%, and for thermoset, calendered is 86.91% at an average. Thus, during active usage, geotextiles are affected by number of factors that lead to value changes of physical and mechanical properties as a result of destructive processes.