

EGU2020-4829

<https://doi.org/10.5194/egusphere-egu2020-4829>

EGU General Assembly 2020

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Microplastic of polystyrene in soil and water: fluxes study from industrial site

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In the paper the experience of investigation of polystyrene content in soil and its distribution from industrial enterprise, where expanded polystyrene foam insulation is produced more than 40 years, is presented. Polystyrene belongs to the one of the most widely produced and used polymer. Once being in the environment, this type of plastic breaks easily and crumbles, and is dispersed by wind and water. Moreover, the danger of environmental pollution by polystyrene may be very serious because of hexabromocyclododecane that can be present in polystyrene as flame retardant additive. Unfortunately, the level of study of environmental pollution with polystyrene and his behavior in soil and water is very poor.

Methodological approaches of sampling and polystyrene identification are shown. Since the enterprise is located on the elevated area close (500-700 m) to a small river with temporary stream, the direct flow of pollutants into the floodplain is possible. Therefore, soil and technogenic deposits at industrial site as well as soil and groundwater within floodplain were collected for study.

In order to identify plastic in solid samples, multiple stages were applied including visual detection, drying, sieving (using mesh widths from 1 to 5 mm), flotation (with heating for the fractions with the size of 1-2 mm and less than 1 mm), and natural organic matter removal. Method of water filtration was used.

Polystyrene was revealed in all solid (12) and liquid (4) samples. High amounts of polystyrene particles with a size less than 5 mm were recorded in technogenic deposits (up to 16700 units/kg) and in soils (up to 1700 units/kg). Particles of microplastic (less than 1 mm) were detected not only in surface layer of soil (0-5 cm) but at the depth of 10-15 cm. Discharges of small granules (less than 1 mm) of raw materials (expanded polystyrene) into environment and its distribution with runoff away from its sources were revealed.

Necessity of further investigation of plastic and microplastic pollution in terrestrial ecosystems in impact zones, including estimates of plastic volume discharges from industrial area with waste, surface runoff and via runoff collector, in order to prevent aquatic ecosystem pollution is

discussed.