

Proposals for doctoral thesis entitled:

“Effect of phosphogypsum fertilization on biomass production by selected energetic plants”

Phosphogypsum is the primary waste byproduct of the wet-acid process for producing phosphoric acid. During this process sulfuric acid dissolves phosphate rock creating a solid/liquid mixture (slurry) of phosphoric acid and calcium sulfate (phosphogypsum). The desired phosphoric acid component is separated from the mixture by filtration leaving phosphogypsum as the waste product. Production of phosphogypsum in Poland is estimated to be 1,5million Mg annually. Phosphogypsum has little market value and is hauled off as a slurry to waste piles called phosphogypsum stacks. Since there are large quantities of phosphogypsum waste, the industry encourages research into potential uses in order to minimize the disposal problem.

Application in agriculture seems to be one of the most reasonable possibility for utilization of phosphogypsum, especially as fertilizer in energetic plant production. However there are some limits for environmental introduction of phosphogypsum. The most important barrier of this type application is the high content in phosphogypsum of radioactive material and heavy metals. So before introduction of phosphogypsum to the soil a lot of different and extended research experiments should be done.

The main aim of proposed doctoral work is to establish the possibility utilization of phosphogypsum wastes for fertilization and soil improvement of physical, chemical and biological properties of soil samples taken from cultivation of selected energetic plants. Phosphogypsum will be used as a source of calcium and sulfur and up to some extent phosphorous for soils that are deficient in these elements. Additionally the possibility of application of phosphogypsum in combination with sewage sludge as source of nitrogen, potassium and supplemental amounts of phosphorus will be also checked.

At the beginning of experimental part the chemical composition of phosphogypsum and sewage sludge will be measured. In the case of phosphogypsum beside of macro- and micro elements content the radioactivity level will be also analysed. The physical and chemical properties of soil under experiment will be also measured.

The research experiment on the effect of phosphogypsum utilization for energetic plant production is planned to establish in Experimental Station of Institute of Technology and Natural Sciences at Falenty. The two factorial field experiment in randomized blocks design with three replications will be conducted. Two species of energetic plants will be selected for experiments.

An equivalent of 170 kg per ha pure nitrogen will be used as fertilization in treatments with sewage sludge. The sludge at this level of application will also fulfill nutritional potassium and phosphorus needs of plants.

Three times per vegetation season soil sample will be taken and the routine analysis will be done. Measurements of physiological indicators that characterize photosynthetic apparatus of particular plants and indicators of soil biological activity also three times per season will be

analyzed. The sample of plant material once per year will be collected and the biomass and calorimetric values will be done.

All results will be statistically calculated.

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