

Abstract of the PhD thesis

**„The investigations on the preparation of controlled or slow release fertilizers
with the use of biodegradable polymers”**

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In the theoretical part of this thesis, a review and analysis of literature sources concerning the environmental impact of fertilizers, the characteristics and classification of slow/controlled release fertilizers, the characteristics of materials used in SRF/CRF production, market analysis and the main goals of the work were discussed.

The experimental part of the doctoral dissertation discusses research on the preparation of long-acting fertilizer materials, obtained with the use of four different polymers, including: two biodegradable aliphatic copolyesters (succinate/sebacinate and butylene linoleate copolyester), aliphatic-aromatic copolyester (succinate and ethylene terephthalate copolyester) and ethylcellulose. Four methods of preparation of extended-release fertilizers were used in the preparation: immersion coating with a polymer solution in an organic solvent, immersion coating with a melt polymer, immersion coating with a water dispersion of polymers and extrusion.

The obtained fertilizer materials were characterized using a number of advanced analytical methods, such as X-ray analysis or SEM scanning electron microscopy. Tests of mechanical crushing strength, measurements of particle size and film-forming ability of coating materials, measurements of surface wettability and measurements of water vapor transmission rate (MVTR) were also carried out.

The degree and time of release of nutrients (nitrogen, potassium and phosphorus) from conventional mineral fertilizers and the obtained fertilizer materials were compared. The release tests were carried out in accordance with the standard method according to PN-EN 13266 and the conductometric method. As part of the statistical analysis, it was found that the spectrophotometric method is characterized by low measurement uncertainty and can be successfully used to determine the content of orthophosphates in the tested materials. As part of the research, it was shown that the release of nutrients from the obtained fertilizer materials is slower compared to the starting fertilizer. It was also shown that some of the obtained

materials with specific properties meet the criteria set out in the standard for fertilizers with controlled release of mineral components.

21.06.2023 r. Kastle Alexandra