Obtaining Environmentally Friendly Trace Element Preparations for Crop Production by the Method of Electric Spark Treatment of Metals

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Keywords: electrospark synthesis, nanoparticles of biogenic metals, ecology of the agrosphere, biodegradation.

The article presents the method of obtaining a biologically acceptable and effective form of trace elements in the form of aqueous dispersions of metals. During the research, we studied the regularities of electro-spark dispersion of metals, which determines the process of synthesis of nanoparticles of biogenic elements. The authors had taken into account, during the research, the following: the water base of the obtained substances solves the issue of their biological adaptability and non-toxicity to the agricultural sector. As a part of the research, the author focused on the use case to use the obtained compound for crop production.

The authors of the study analyzed and investigated metal nanoparticles using modern methods of electron microscopy (SEM, TEM) and X-ray diffraction analysis of the metal phase of colloidal solutions. As a research result, we determined: the composition, structure, and average sizes of the obtained nanoparticles of various metals.

The authors of the research work had made and investigated a complex compound, which included metal nanoparticles, in particular, such as iron Fe – 1800 ppm; copper Cu – 400 ppm; zinc Zn – 1000 ppm; manganese Mn - 800 ppm. The compound was tested in the field during the cultivation of winter wheat at different stages of organogenesis. The application rate of the prepared compound was 1-1.5 l/ha, respectively 1.0-1.5 liters of the compound were diluted in 250 liters of water.

As a result of the research work, it has been established that the proposed technology of using the colloidal form of trace elements allows to obtain economically valuable results in the cultivation of grain crops, namely an increase in yield and grain quality indicators. The presented technology for growing grain crops is cost-effective. At the same time, the studies conducted by the authors found that the preparations obtained by the electric spark method do not pose a threat to the environment, the agricultural sphere, and humans due to their probable biodegradation.