Properties of Low Dimensional Semiconductor Materials Obtained by Electrochemical Methods

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Electro-spark method for obtaining of nanostructured and ultrafine powders of metals and semiconductor alloys is one of the most effective. Thus, an important scientific and technical challenge remains to increase the proportion of ultrafine and nanostructured particles in the spark erosion powders.

Cadmium telluride and its solid solutions are of particular interest in terms of both practical and scientific research. This work is aimed in obtaining of low dimensional semiconductor and metallic systems, the study of their characteristics, namely the finding of qualitative and quantitative composition, particle formation mechanism and stability of solutions. We have studied following system: Cd-Cd, Te-Te, K:Cd - Te-A:, K:Te -A: Cd, CdTe in aqueous and thioglycolic acid solution. Semiconductor purity materials are used for making of electrodes. In order to set qualitative composition and size of the highly dispersed systems an X-ray analysis (XRD) have been used. To carry our XRD experiments obtained colloidal solutions were dispersed, and from the resulting sediment there have been made samples in the form of tablets. It is found that at potential difference between the electrodes within 200-240 an electric arc arises. The traces of electrical failure on the anode are visually observed after 30 seconds of current passing. Te (K) - Cd (A); Cd (K) - Te (A); Te(K) - Te(A) solutions show opalescence in the case of using cadmium electrodes. The systems changes color to yellow-brown. Presented studies have confirmed the formation of highly dispersed particles in all studied systems.

According to spectroscopic studies of colloidal solutions the absorption peak gradually shifts toward longer wavelengths over time, and its color intensity decreases. Obtained systems are stable for 12-14 days. The composition of the particles according to XRD data is uniform and correspond to elemental composition of the electrodes.