SUMMARY

of PhD thesis by Milena Kiliszkiewicz

„Properties of electronic and photonic structures fabricated by ink-jet printing"

Printed electronics is a rapidly developing topic that combines elements of chemistry, material science, technology and electronics. The technique, which enables the direct application of the desired pattern on a substrate (rigid or flexible), is an alternative to traditional processes such as lithography or screen printing. It does not require photoresist layers, masks, etc. Besides the mentioned advantages, ink-jet printing enables shortening of the time needed to create a structure by reducing the number of technological steps.

Quite a challenge for technologists is the stability of the technology used. Discontinuities and short circuits are characteristic defects of the ink-jet printing technique. The result is, among other things, from the instability of the ejected droplets, the use of a limited number of nozzles and too rapid evaporation of the solvent. This dissertation describes printed electronics technology.

This work focused on the issues of ink-jet printing electronic and photonic structures. During our work, we have determined how to prepare the substrate for the printing process so that electrical and geometric parameters characterize the structures. Several tests were conducted to determine the optimum stable temperature during printing, the selection of an appropriate value for the distance between individual ink drops (*drop space*) and many other parameters. The waveform of the printing profiles, temperature and time required to form a functional conductive or dielectric layer were also selected. Reliability studies of the conductive structures were performed, which determined the time stability of the studied objects. The author also analyzed inks containing quantum dots.

The dissertation contains the results of research on the morphology of electronic and photonic structures. The results obtained showed that it is possible to print electronic structures in which 93 % of the printed structures work correctly. The paper also presents the results of printed planar microwave circuits. The results obtained during the study indicated further directions for the development of printed electronics and functional inks.

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