SUMMARY

„Fabrication and properties of passive elements made in thin- and thick-film technique integrated with a multilayer printed circuit board"

The doctoral dissertation concerns issues related to the production of passive elements, which include resistors, capacitors and inductors which are integrated within a printed circuit board. The aim of the dissertation results from the dominant trends in the production of modern electronics. The miniaturization of all electronic assemblies forces the search for new methods of production and development of technologies that have been niche so far, or the dissemination of those that have been used so far only by advanced research centers, producing electronics for special applications (e.g. military, space). The development of the technology of components integrated with the printed circuit board will not only disseminate it, but will be a strong stimulus for the development of materials for embedded components, optimization of their parameters, increasing the range of achievable parameters and availability, and thus reducing the costs of their production.

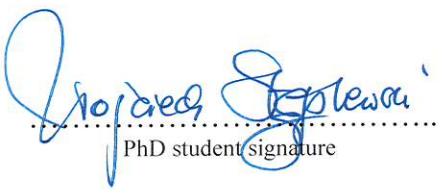
Although the technology of passive embedded components has been known for many years, so far it has been used in the production of electronics to a limited extent. The dissertation is therefore also intended to present this subject to a wider group of electronics manufacturers, because it is an alternative method of constructing electronic circuits, which has the potential to optimize physically manufactured systems and allows for the development of new solutions. In Poland multi-layer printed circuit boards with embedded components are not manufactured. Therefore, this dissertation may result in increased interest in this technology among Polish electronic companies. The developed new technological solutions are an important supplement to the previously used technologies for the production of printed circuit boards, which may contribute to the development of a highly advanced method of miniaturization of electronic products, increasing the functionality of electronic devices. This solution allows for the production of a new generation of printed circuit boards with high component packing density, being an important supplement to the existing methods of producing printed circuits. Therefore, it can be concluded that the dissertation has a significant implementation aspect. The immediate implementation goal was to develop such technology of printed circuit boards that would strengthen the competitiveness of domestic companies, especially small and medium-sized ones, interested in modernizing their

production and manufacturing modern products. This new technological solution will make it possible to reduce the technological gap of domestic electronic companies in relation to the most developed countries by effectively implementing a highly advanced method of miniaturization of electronic products.

The presented technology of embedded components has great development potential. With the current technical advancement of devices for the production of printed circuit boards allows for the manufacturing of electronics with appropriate quality. The technology ensures full compatibility of multilayer printed circuits with embedded passive elements with the lead or lead-free assembly technique. It can be implemented at low cost to any multilayer printed circuit board manufacturer.

Detailed research tasks are based on the experimental analysis of the physicochemical and electrical properties of the materials used for the production of embedded passive elements and the study of functional systems made of them. The operating characteristics of the basic elements and systems made of them as a function of the assumed technology and operating conditions were examined. This allowed for the collection of data on the behavior of materials, components and functional systems during their manufacture and operation. This will allow in the future to control the process of their production so that functional systems with components embedded into printed circuit boards have the desired operating properties.

The dissertation consists of 10 chapters. The first chapter describes the purpose and scope of the dissertation. The second chapter presents the basic information on embedded thin-film resistors, thick-film resistors, capacitors and inductors. The following chapters three to eight describe the technology and properties of PCB-integrated components on the basis of our own researches. The ninth chapter presents the properties of selected functional systems (filters, generators, RFID systems), in which some of the passive elements were embedded into the printed circuit board. Chapter 10 summarizes the main results of the research together with the most important conclusions. This content is followed by a list of literature cited in the dissertation.



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