Chapter 9. Ultrasonic Soldering and Metallization in Electronics

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Abstract: The physical models of primary and secondary ultrasonic effects in liquid media are described, offering a comprehensive understanding of these phenomena. The mechanisms underlying oxide film removal and the enhancement of solder wetting on materials under the action of ultrasonic vibrations are thoroughly explored. In particular, the formation of soldered joints with nonmetallic materials in an ultrasonic field is elucidated, highlighting the activation of diffusion and chemical interaction of solder components with materials. Detailed insights into modern technological equipment and tools utilized in ultrasonic processes are provided, shedding light on their capabilities and functionalities. Furthermore, the impact of ultrasonic process parameters on the properties of contact joints is examined, offering valuable guidance for optimizing process conditions. Ultrasonic technology emerges as an environmentally friendly solution, often referred to as "green" technology, as it obviates the need for fluxes and the subsequent removal process, as well as eliminates the use of lead-containing solders. The widespread adoption of ultrasonic soldering and metallization processes is observed in Western Europe and the United States, underscoring their significance and utility in modern manufacturing practices.

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