Comparison of Ultrasonic Welding and Thermal Bonding for the Integration of Thin Film Metal Electrodes in Injection Molded Polymeric Lab-on-Chip Systems for Electrochemistry

We compare ultrasonic welding (UW) and thermal bonding (TB) for the integration of embedded thin-film gold electrodes for electrochemical applications in injection molded (IM) microfluidic chips. The UW bonded chips showed a significantly superior electrochemical performance compared to the ones obtained using TB. Parameters such as metal thickness of electrodes, depth of electrode embedding, delivered power, and height of energy directors (for UW), as well as pressure and temperature (for TB), were systematically studied to evaluate the two bonding methods and requirements for optimal electrochemical performance. The presented technology is intended for easy and effective integration of polymeric Lab-on-Chip systems to encourage their use in research, commercialization and education.