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PtIr Microwire Bonding for Deep-Brain Microelectrode by Electroplating

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Microelectrodes have been extensively implanted into patients' deep brain for long-term treatments of nervous system disorders, and Pt and PtIr are the preferred materials for the microelectrode film and microwire, respectively, because of their biocompatibility. A novel method of microwire bonding for connecting $Pt_{90}Ir_{10}$ microwires to the microelectrode is presented in this paper. After the microelectrode was fabricated through microelectromechanical systems (MEMS) techniques, the $Pt_{90}Ir_{10}$ microwire was connected to the microelectrode by electroplating Pt film on the microwires fixed on the connection pads of the microelectrode, instead of using a traditional bonding or soldering process. Optical photomicrography and scanning electron microscopy (SEM) revealed that the $Pt_{90}Ir_{10}$ microwire was connected tightly to the microelectrode by electroplating. The measured tensile strengths of the microwire connections reached up to 0.375 MPa for the Pt film with a thickness of 3 μm and above, and the maximum tensile force that the microwire (75 μm diameter) could withstand was about 1.6 N. Experimental results indicated that the electroplating connection could provide sufficient strength for the microelectrode to accurately reach the target position in the deep brain.

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