

Heterogeneous Integration of a MEMS System Intended for Neural Implantation

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Through the integration of electronics with Micro Electro Mechanical Structure (MEMS) based electrode arrays, researchers from California Institute of Technology and Jet Propulsion Laboratory hope to significantly improve the quality of signals currently obtainable from passive electrode arrays. Heterogeneous integration of the MEMS electrode array with the integrated electronics offers specific challenges, including materials selection (for biocompatibility in this case), handling of delicate structures during processing operations, interconnect process development, and choice of coating materials. Many of such challenges are directly in line with those faced throughout the currently developing field of MEMS packaging. The MEMS device discussed above consists of a 10 x 10 array of fine, 1 mm long, electrically isolated, Si electrodes that each terminate to a solderable pad. Utilizing flip chip technology, the electrode arrays were connected to the integrated circuits. Development efforts included evaluation of different interconnects, underbump metallizations, and underfills as well as optimization of soldering and coating parameters.