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Abstract Title:	**A Micro Electrode Array (MEA) Based on Flexible Silicone Substrate for Neural Prosthesis**
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Author Block:	*E.Kim[1,2], M.Lee[1,2], S.Kim[1,2].* [1]School of Electrical Engineering and Computer Science, Seoul National University, Seoul, Republic of Korea; [2]Nano Artificial Vision Research Center, Nano Bioelectronics & System Research Center (NBS-ERC), Seoul, Republic of Korea.
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Purpose: To add advantages of printed-circuit technology in forming microelectrodes arrays (MEA's), to widely used silicone elastomer based electrodes, we suggest to combine the latter with a polyimide layer where micro-fabrication of MEA's can be readily achieved.
Methods: 2μm of PECVD silicon oxide film was deposited as a sacrificial layer. A lower polyimide was coated by 10μm in thickness and cured on a hotplate. Ti/Au/Ti (500Å/ 4000 Å /1000 Å) was evaporated by E-gun for conductive lines, and patterned by photolithography. The upper Ti layer was used as an etch mask during the structure patterning process, and the lower two layers were patterned to make the conduction lines between sites and pads. After the metal patterning, the upper polyimide was coated with a 6μm thickness to provide the stress-free condition Additional Titanium was evaporated for the etch mask and patterned for structure defining. The whole structure was defined by reactive ion etcher (RIE). A polyimide insulating electrode was released by 20% HF. Silicone elastomer (MED-4211: Nusil) was coated on a separate bare silicon wafer to form an additional silicone substrate. The polyimide electrode array was located carefully on the uncured silicone. The processed wafer was cured on a hotplate at 60°C for 30 minutes and completely cured at 120°C for one hour to avoid the expansion of air bubbles. Structure release was done after careful cutting of the edge by precision knife. To certify the adhesion between silicone elastomer and polyimide, flex test was done in the angle between -45°~+45° for 28,800 times a day, and the flex count was measured by the conversion factor. For testing short-term stability of the fabricate electrode *in-vitro*, phosphate buffered saline with pH 7.4 was used, and the electrode was soaked for 20 days at 60°C.
Results: Silicone elastomer based MEA combined with polyimide was successfully fabricated by the proposed method. After the flex test and *in-vitro* soaking test, there was no detachment between layers no cracks on microscopic examination.
Conclusions: The adhesion quality between silicone elastomer and polyimide layer was satisfactory for the trial of *in-vitro* test. Silicone elastomer based MEA combined with polyimide can be another option as a stimulating electrode for retinal stimulation.

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