

## THE TRIBOLOGICAL INVESTIGATION OF THE THIN FILM ELECTRODE ARRAYS

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### KEYWORDS

*Biotribology; experiments in tribology; contact and adhesion, cochlear electrode array*

### ABSTRACT

Hearing loss is worldwide health problem with various types, and one common form is the sensorineural hearing loss, resulting from the absence or damage of hair cells in the cochlea within the inner ear. Over the past thirty years, cochlear implants have emerged as a successful clinical intervention. The electrode array, a crucial component of the cochlear implant, plays a vital role in compensating for the dysfunction or absence of hair cells in the cochlea.

During the placement of the electrode array into the cochlea, there is a risk of damaging the basilar membrane or the lateral wall upon the contact. This is attributed to the impact of the insertion force, a significant factor in intracochlear trauma. Existing studies indicate that the insertion force is influenced by various factors for the conventional electrode arrays, including the mechanical properties of the electrode array [1], insertion speed [2], and the coating of the electrode array [3]. Additionally, friction and adhesion forces influence the contact of the electrode array within the cochlea. Furthermore, despite the emergence of a new generation of thin-film electrode arrays as a potential replacement for the conventional cochlear electrode arrays, the tribological characteristics of these arrays remain unexplored.

This study investigates the bio-tribological aspects, specifically adhesion and friction polymer-based thin-film electrode arrays within a cochlear spiral orbit. Two distinct experimental setups have been developed. In the first experimental setup, frictional dynamics of a thin-film electrode array is investigated in which the thin-film cochlear electrode array is tested on a flat dry and wet surface. The unique experimental setup is capable of measuring the friction and normal loads for different sliding speeds. The friction loops are gathered in order to explain the static to kinetic friction regimes. In the second experimental setup, thin-film electrode array is inserted to an artificial cochlear within a cochlear spiral orbit while measuring the normal and friction loads. This approach

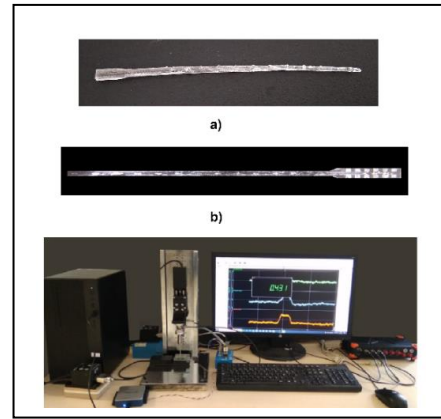


Fig.1 a) Conventional electrode array, b) Thin-film electrode array, and c) Picture of the biotribological experimental setup.

provides a more realistic simulation of in vivo conditions, enhancing insights into how the thin film electrode array interacts within the cochlear.

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