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CILIA

Customized Intelligent Life-Inspired Arrays

Integrated Project

Information Society Technologies
Future & Emerging Technologies
Proactive Initiative BIO-I3

DELIVERABLE: D1.4.6 – Executive Summary

F A B R I C A T I O N A N D C H A R A C T E R I S A T I O N O F
N E W G E N E R A T I O N O F H A I R S E N S O R S F O R
O P E R A T I O N I N A I R

Actual submission date:	December 12, 2008		
Start day of project:	September 1st, 2005	Duration:	48 months
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EXECUTIVE SUMMARY

New MEMS-based hair-sensor arrays for operation in air have been fabricated and characterised. These sensors are based on the proven principle of capacitive read-out by employing a drag-torque induced rotation of a membrane. Using a modified fabrication scheme we have been able to:

- a) counteract the membrane curvature by using aluminium instead of chromium.
- b) improve the electrical conductance of the electrodes.
- c) reduce the gap between the capacitor plates.
- d) have a well-defined sacrificial isotropic dry etch release providing high yield.
- e) produce two-layered 1 mm-long SU-8 hairs with much thinner upper part resulting in relative low moment of inertia.

With respect to characterisation we have:

- f) obtained clear evidence for viscosity induced hair-hair interactions (viscous coupling) for stationary hairs at distances up to 15 times the hair diameter (in dependence of the frequency).
- g) observed strong frequency dependence of viscous coupling.
- h) shown qualitatively that our new sensors have a much improved sensitivity allowing to record perceptible sounds and music.
- i) measured a clear figure-of-eight sensitivity in the hair-sensor arrays illustrating the vectorial (particle velocity) nature of the sensors.
- j) shown that the sensor sensitivity and resonance frequency can be adaptively changed by electrostatic spring softening to be tailored to specific tasks.
- k) not yet obtained a full qualitative characterisation the reason being that sensor response closely follows excitations due to the absence of clear marked resonances making it harder to discern specific sensor response.

In combination with the availability of the interface electronics, developed in WP3.2, we now have a sensor system allowing deployment in the cilia demonstrators.