

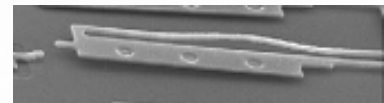
Methodology and high level design of failures: specific application to thermal actuator

Objectives

- Closed form modeling of MEMS thermal actuator using FEM and VHDL-AMS.
- FMEA on thermal actuators.
- Reliability study of thermal actuators using FEM modeling.
- Testing and modeling the environmental influence on thermal actuators.
- Raman spectroscopy on thermal actuator to measure temperature distribution.
- Application of worst-case yield optimization methodology for MEMS for DfM.

Partners involved and roles

- LAAS, F (Modeling, manufacturing, functional & ageing testing)
- HWU, ISLI, UK (MEMS failures, FMEA, high level design of failures)
- IMEC, B (Raman spectroscopy, Environmental influence testing)
- ITEM, D (Worst-case yield optimization methodology)



Back bending failure

Summary of results

- Closed form modeling (FEM and High-level) of thermal actuator.
- FMEA on thermal actuator and design optimization.
- Reliability analysis of thermal actuators.
- Testing the environmental influence on thermal actuator and its modeling .
- Raman spectroscopy to measure the temperature distribution in thermal actuator.



Thermal actuator

Offer to industry

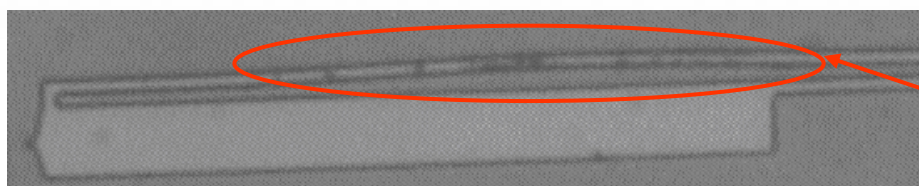
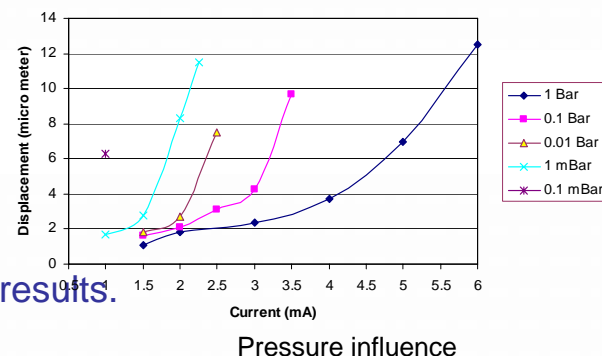
- MEMS functional and reliability modeling (FEM and High-Level)
- MEMS failures, FMEA methodology and design optimization.
- Environmental influence, reliability testing and analysis.
- Raman spectroscopy for temperature distribution and failure analysis in MEMS.
- MEMS functionality modeling at extreme conditions.

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Project status, date:

Phase 2 (experimental validation),

- Application of worst case methodology.
- Validation of modeling data with experimental results.
- Modeling the ageing of the actuator.



Oxidation in hot arm during testing