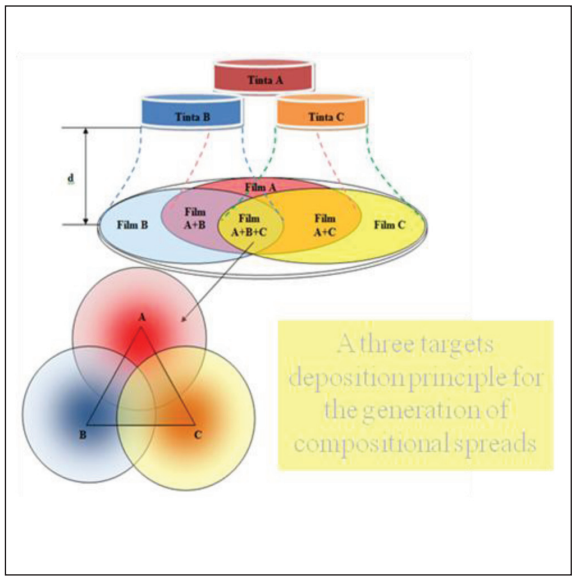
Exploration System for Optimization of Shape Memory Actuation in Compositional Spreads

Goal of the project:
The project aims to design, fabricate and develop a combinatorial exploration system for optimization of microactuation using the sputtering technique of thin film compositional spreads.

Short description of the project:
The project has as main fundamental objectives the development of an exploration system that would allow:



• a combinatorial optimization of actuation using the sputtering technique to generate compositional spreads;

•the development of models for combinatorial systems adapted for investigation of actuation;

•the implementation of the combinatorial exploration system for the case of intelligent materials, with focus on shape memory alloy families;

•the development of microactuators with controlled and optimized functionality;

•the investigation or modelling of systems for the exploration, and

•the microfabrication of materials with "on demand" properties, adapted for applications in microsystem engineering.

Project implemented by:
A research group of the te Department of Materials and manufacturing Engineering of the "Politehnica" University of Timisoara

Implementation period: 2011-2014

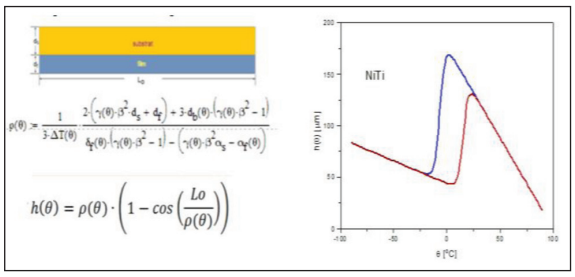
Main activities:
Several experimental objectives have been defined:
•identification of specific design requirements for a system dedicated to generating combinatorial libraries of metallic materials;
•design of an exploration path for specific functionalities;
•design and fabrication of an exploratory system that allows sputtering of compositional spreads;
•design and microfabrication of substrates for the investigations of functional libraries;
•microfabrication of sputtered compositional spreads based on shape memory alloy compostions;
•microstructural-compositional characterization of libraries;
•design of an actuator based on thin film microfabrication.
The exploratory system aims to accelerate the innovation process in the fabrication of micro sensors and actuators.

"The best way to predict the future is to invent it"

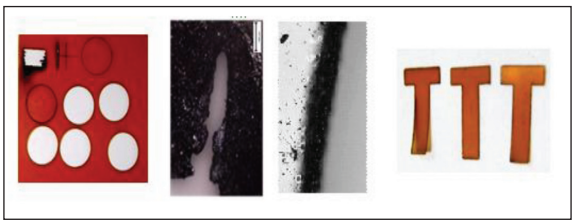
Alan Kay

Results:
A combinatorial deposition system was designed and is in the process of beeing finalized for the smart materials investigations.

A model for the prediction of actuation in bimorphs based on shape memory alloy films was identified.



Substrates for deposition of thin films were manufactured by laser cutting.



Fields of interest: Materials Engineering, Smart Sensors and Actuators, Micro and nanoengineering, Microsystems

Financed through/by:
Romanian National Authority for Scientific Research, grant CNCS – UEFISCDI, project number PN-II-ID-PCE-2011-3-0837

Research team:
Members and collaborators of the Department of materials and Manufacturing Engineering:
Assoc. Prof. Corneliu M. Craciunescu
Prof. Victor Budau
Prof. Ion Mitelea
Assoc. Prof. Aurel Ercuta

Research centre for Processing and Characterization of Advanced Materials

Aplicability and transferability of the results:
The output of the project is related to the development of a high-performance research instrument which will facilitate the initiation of accelerated innovation processes in the advanced functional materials field. Actuators like the ones for which the project develops an advanced R&D tool are expected increase the development of miniaturized products and expected to take over a variety of functions in microsystem dedicated to future aircraft, translating electronic or optical equipments.

Contact information:
Assoc. Prof. Corneliu M. Craciunescu
Politehnica University of Timisoara
Department of Materials Science
Bd. Mihai Viteazul 1, 300222 Timisoara, Romania
Tel: +40-256-403655, Fax: +40-256-403523
craciun@mec.upt.ro

"The best way to predict the future is to invent it"

Alan Kay