# Research projects in LEMTA related to IIMEC

T. Ben Zineb

❑ **Elaboration of HT-SMAs and its behavior modeling**

❑ **Behavior modeling of Porous SMA and their applications**

❑ **Extension of Fe-based SMA behavior in finite transformation framework**

❑ **Modeling of the Hydrogen diffusion effect on SMA Behavior**

❑ **Modeling of composite hybrid Ferroelectric/SMA thin films behavior for Harvesting energy applications**

Elaboration of HT-SMAs and its behavior modeling (PhD Thesis Th. ARA)

Project coordinated by the LEM3 (E. Patoor) and in collaboration with the LEMTA (C. Bouby)
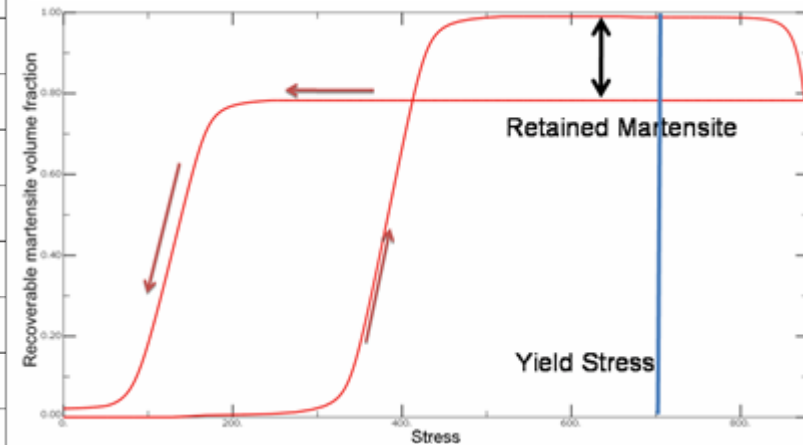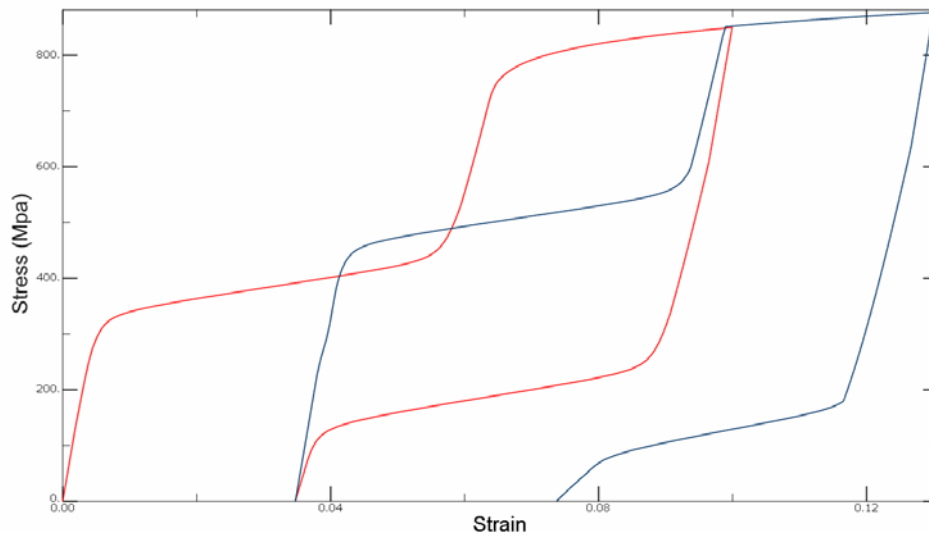
❑ **Elaboration and experimental characterization of HT-SMAs**

❑ **Modeling of HT-SMA behavior using thermo-dynamical and micromechanical approaches**

❑ **Implementation in a finite element code**
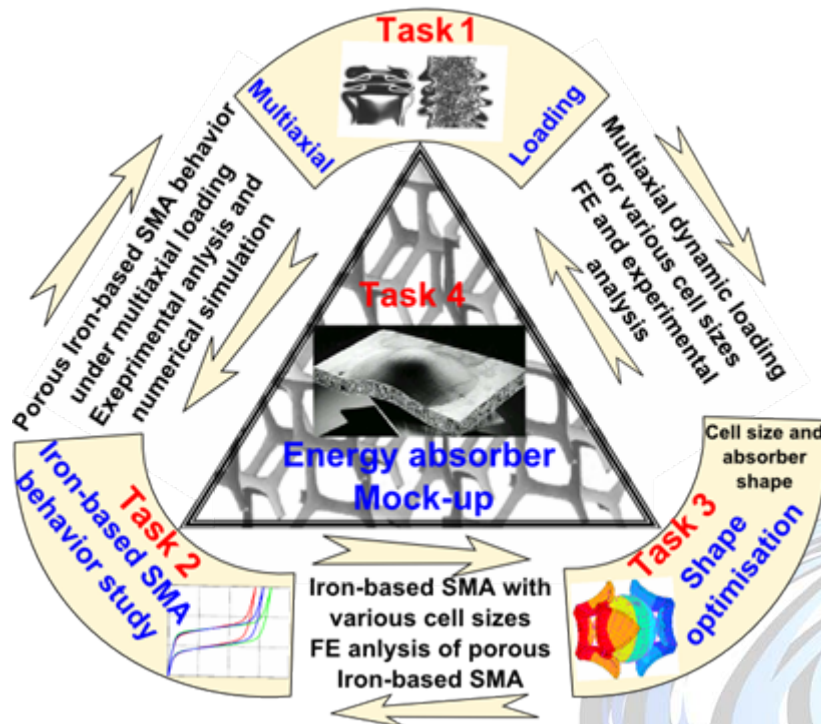
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Behavior modeling of Porous SMA and their applications

SMARTEAD 2012 – 2015

Energy absorption optimization using Porous

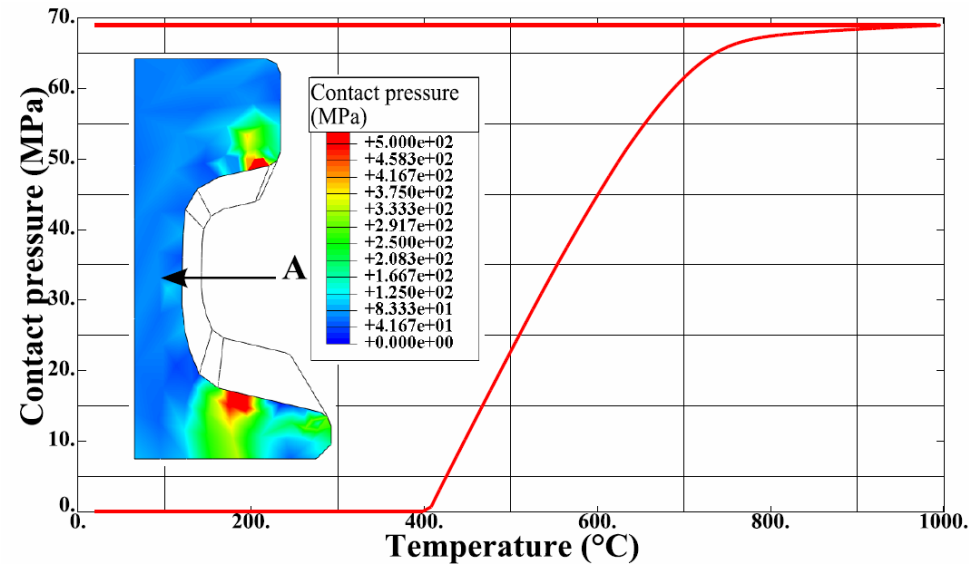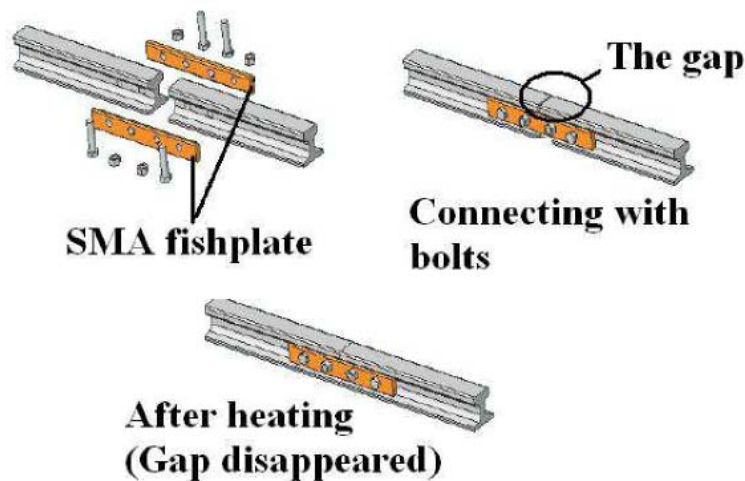**Fe-based SMA**

(Coordinated by LEMTA and involves LEM3, …)

Task 1

Multiaxial Loading

Porous Iron-based SMA behavior under multiaxial loading and Exeprimental anlysis and numerical simulation

Multiaxial dynamic loading for various cell sizes FE and experimental analysis

Task 4

Energy absorber Mock-up

Task 2
Iron-based SMA behavior study

Cell size and absorber shape

Task 3
Shape optimisation

Iron-based SMA with various cell sizes FE anlysis of porous Iron-based SMA

PHC BOSPHORE 2012 – 2014

Porous NiTi SMA for biomedical

applications

Lorraine University (T. Ben Zineb) in

collaboration with :
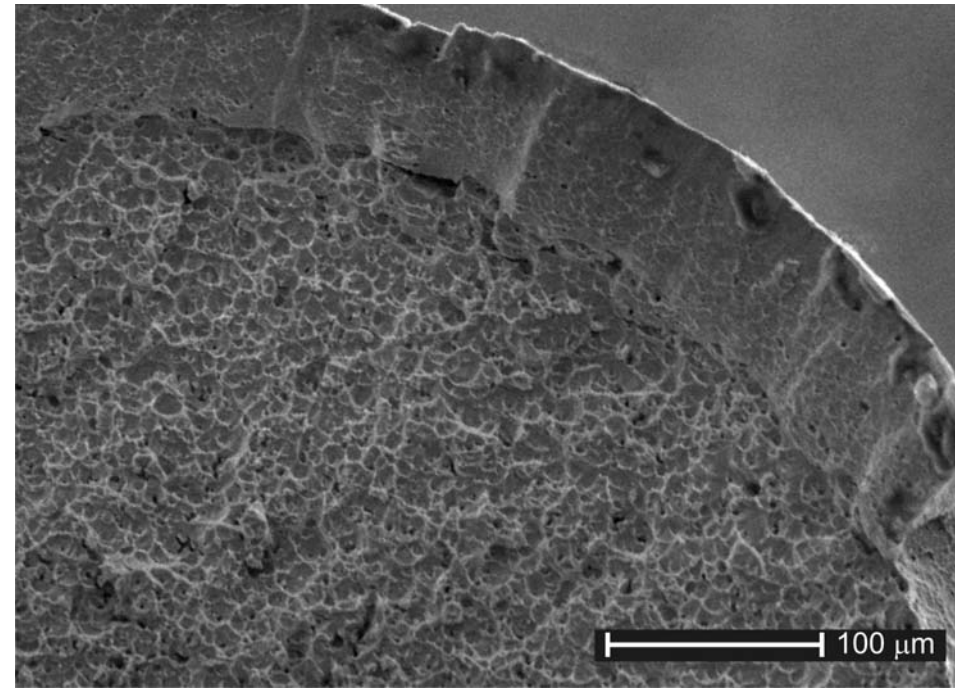
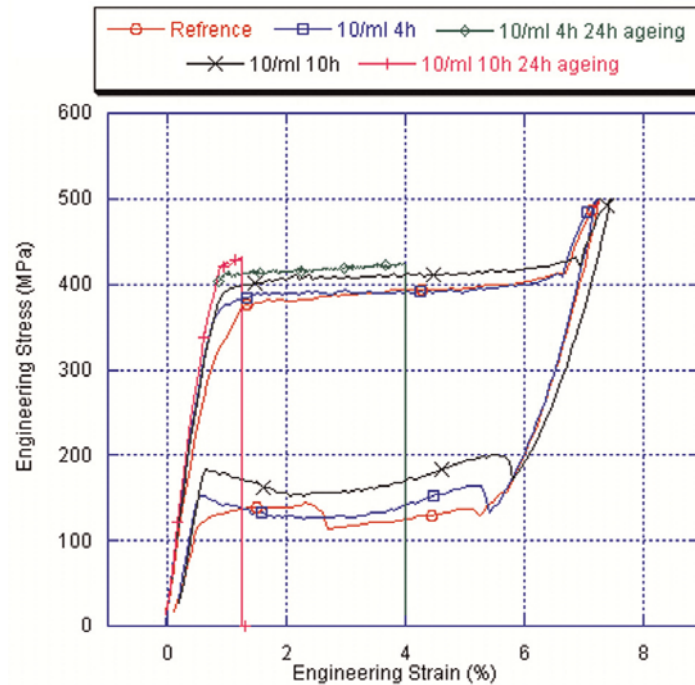**Hacettepe University (B. Kockar) and**

Extension of Fe-based SMA behavior in finite transformation framework

☐ **Fe-based SMA model developed during the PhD thesis of**

   Walid KHALIL (small transformations)

☐ **Extension of the modeling in collaboration with B. Kiefer**

   (Dortmund University)

technische universität dortmund

W. Khalil, A. Mikolajczak, C. Bouby and T. Ben Zineb, "*A constitutive model for Fe-based SMA considering martensitic transformation and plastic sliding coupling: Application to finite element structural analysis*", Journal of Intelligent Material Systems and Structures (In press),

Modeling of the Hydrogen diffusion effect on SMA Behavior

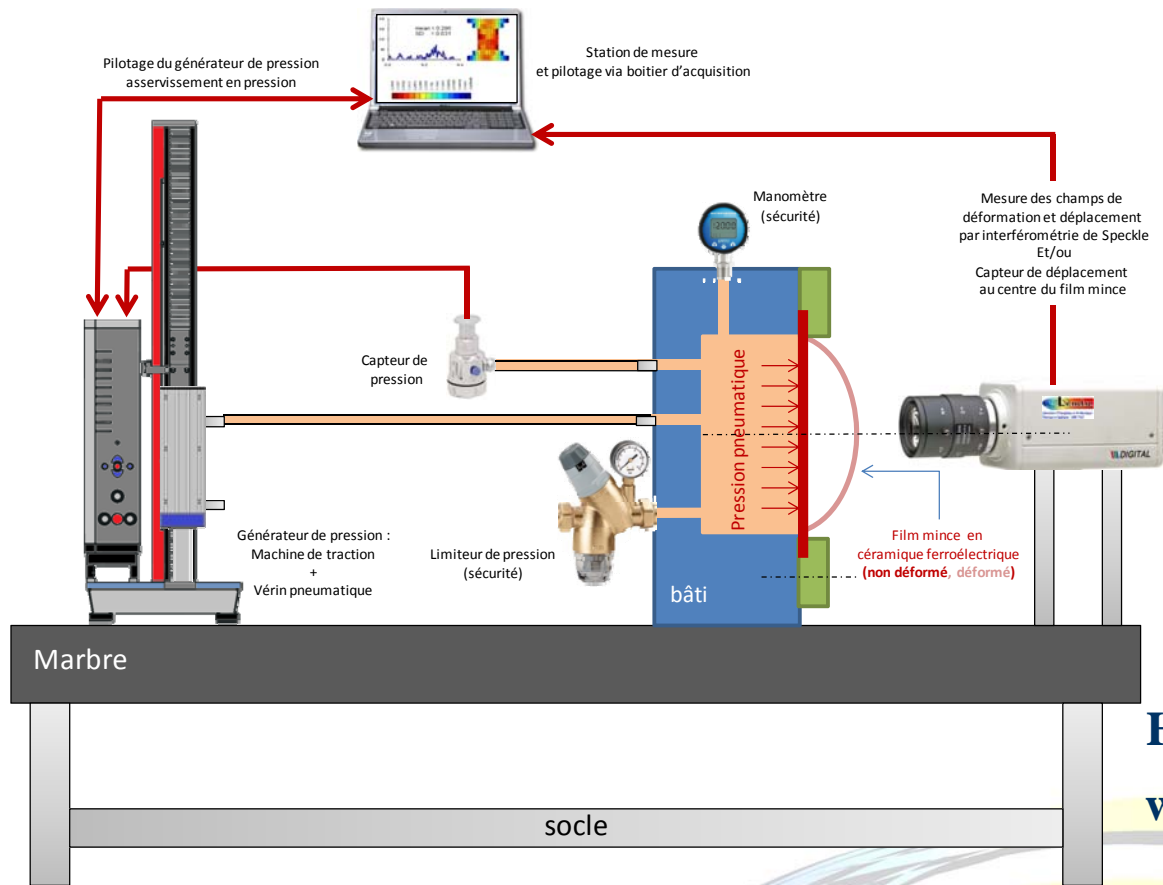**In collaboration with Dr Tarak Bouraoui and Dr Fehmi Gamaoun (Universities of Sousse and Monastir, Tunisia)**

Modeling of composite hybrid Ferroelectric/SMA thin films behavior for Harvesting energy applications

SMART-HARVESTERS

2012 – 2014

Hybrid composite thin films with SMA and Ferroelectric layers

In collaboration with Michigan University (Dr. N. Lajnef)