Eco-materials Group

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Research field: Alloy Design, Structural & Functional Materials

Research topics conducted within the G-COE project

1. Biomedical Shape Memory & Superelastic Alloys

Shape memory and superelastic alloys become widely applied for biomedical devices such as stents, catheter and orthodontic wires. Our group have developed "toxic element free" shape memory alloys (SMAs) based on biocompatible Ti and Au, for example, for the replacement of Ti-Ni practical SMA.

2. Ferromagnetic SMA Base Materials

The actuation speed of most SMAs is relatively slow (~Hz) compared with piezoelectric materials due to thermal cycling process. For high frequency, ferromagnetic SMAs are expected which can be driven by magnetic field, but the brittleness is a problem for practical applications. We have developed a new composite composed of NiMnGa particles and polymer matrix.

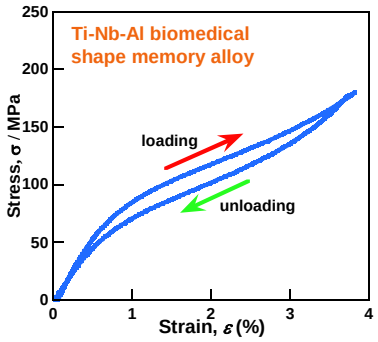
3. High Temperature SMA/ Actuator Materials

Since the highest actuation temperature of Ti-Ni SMA is limited to be 100℃, SMA with higher actuation temperature is required for valves, for example. We have develop new high temperature (HT) SMA such as TiAu and TiPt base alloys. Besides, high temperature structural materials are also studied.

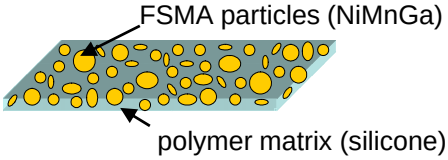
4. Hydrogen Storage Materials / New Processing

New hydrogen storage materials, new material processing, and new ferromagnetic materials are studied.

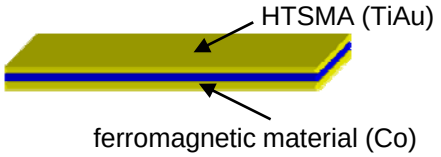
1. Biomedical SMAs (TiNbAl)



2. FSMA base composite



3. High Temperature Magnetic Actuator



Three representative new SMA-base materials: (1) nontoxic superelastic SE (SE~6%), (2) FSMA base composite for high frequency magnetic motion, and (3) high temperature magnetic actuator material.

Representative publications

1. Mat.Sci. Eng. A, 438-440 (2006) pp.18-24.
2. Mat.Sci. Eng. A, 438-440 (2006) 383-386
3. Mat.Sci. Eng. A, 438-440 (2006) 830-834.
4. Mat. Trans., 47 (2006) 505-512.
5. Mat. Trans., 47 (2006) 518-522.
6. Acta Mater., 54 (2006) 423-433
7. Acta Mater., 54 (2006) 2419-2429.