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1. Research Summary

We have been developing new functional biomaterials especially for Ni-free Ti-based shape memory and superelastic alloys. In this year, the systems of the Ti-Nb base, Ti-Cr base and Ti-Pt base were investigated. Besides, new Au-based shap memory alloys were developed from the viewpoint of fundamental mechanical properties and effects of chemical compositions, additional elements and heat treatment.

2. Publication List

- 1) M. Tahara, H. Y. Kim, H. Hosoda and S. Miyazaki, "Shape Memory Effect and Cyclic Deformation Behavior of Ti-Nb-N Alloys", *Functional Materials Letters*, **2** (2009) 79-82.
- 2) Y. W. Chai, H. Y. Kim, H. Hosoda and S. Miyazaki, "Self-accommodation in Ti-Nb Shape Memory Alloys", *Acta Materialia*, **57** (2009) 4054-4064.
- 3) M. Tahara, H. Y. Kim, H. Hosoda and S. Miyazaki, "Cyclic Deformation Behavior of a Ti-26at.% Nb Alloy", *Acta Materialia*, **57** (2009) 2461-2469.
- 4) M. Tahara, H. Y. Kim, T. Inamura, H. Hosoda and S. Miyazaki, "Effect of Nitrogen Addition on Superelasticity of Ti-Zr-Nb Alloys", *Materials Transactions*, **50** (2009) 2726-2730.
- 5) H. Hosoda, Y. Horiuchi, T. Inamura, K. Wakashima, H. Y. Kim and S. Miyazaki, "Effect of Carbon Addition on Shape Memory Properties of TiNb Alloys", *Mat. Sci. Forum*, **638-642** (2010) 2046-2051.
- 6) T. Inamura, Y. Yamamoto, H. Y. Kim, K. Wakashima, S. Miyazaki and H. Hosoda, "Stress Amplitude Dependence of Internal Friction in TiNbAl Shape Memory Alloys", *Mat. Sci. Forum*, **638-642** (2010) 2064-2067.
- 7) Y. Kusano, T. Inamura, H. Hosoda, K. Wakashima and S. Miyazaki, "Phase Constitution and Mechanical Properties of Ti-Cr and Ti-Cr-Sn Alloys Containing 3d Transition Metal Elements", *Advanced Material Research*, **89-91** (2010) 307-312.
- 8) S. Tsutsumi, T. Inamura, K. Wakashima and H. Hosoda, "Phase Equilibria of AlMn-Cu₂MnGa System", *Advanced Material Research*, **89-91** (2010) 574-579.
- 9) T. Inamura, Y. Yamamoto, H. Hosoda, H. Y. Kim and S. Miyazaki, "Crystallographic Orientation and Stress-amplitude Dependence of Damping in Martensite in Textured Ti-Nb-Al Shape Memory Alloy" *Acta Materialia*, accepted.

3. Review Paper

- 1) H. Hosoda, "Development of Superelastic Shape Memory Alloys for Biomedical Uses", *Engineering Materials*, **57**, No.6 (2009) 53-57.

4. Presentations in International and Domestic Conferences

- 1) H. Hosoda, "What is Shape Memory Alloy? Recent Topics and Orthodontic Applications of Shape Memory Alloys", *First Lecture Meeting for Young Scientists and Graduate Students*, School of Dentistry, Advanced Oral Science Research Institute, Aichi Gakuin University, Nagoya, Japan, April 14 (2009). (Invited Lecture)
- 2) H. Hosoda, Y. Horiuchi, T. Inamura, K. Wakashima, H. Y. Kim and S. Miyazaki, "Effect of Carbon Addition on Shape Memory Properties of TiNb Alloys", *Thermec'2007, 7th International Conference*

on Processing & Manufacturing of Advanced Materials, Berlin, Germany, August 24 (2009). (Invited Paper)

- 3) H. Hosoda and S. Miyazaki, "Shape Memory and Superelastic Alloys as Mechanical Biocompatible Materials", *Symp. Mechanical Biocompatibility, Japan Institute of Metals 2009 Fall Meeting*, Kyoto University, Kyoto, Japan, Sept. 15 (2009). (Invited Talk)
- 4) H. Hosoda, "Development of Ni-free Biomedical Superelastic Alloys", *Joint Research Workshop, Institute of Materials Research, Tohoku University, and Tohoku Branch Meeting, Japan Biomaterial Society, Tohoku University, Sendai, Japan, July 28 (2009)*. (Invited talk)
- 5) T. Inamura, H. Hosoda and S. Miyazaki, "Martensitic Transformation, Texture and Mechanical Properties of Ti-Nb Based Superelastic Alloy", *Intl. Conf. on Active/Smart Materials, Thiagarajar College of Eng., Madurai, India, (2009) 47*. (Invited talk)
- 6) H. Hosoda, H. Saito, T. Inamura and S. Miyazaki, "Effect of Aging on Microstructure and Mechanical Properties of Ti-Mo-Mn Shape Memory Alloy", *Proc. New Research and Development of Shape Memory Alloy for Advanced Functional and Bio-Materials, SMA Symposium, Association of Shape Memory Alloy, (2009) 18-21*. (oral presentation)
- 7) Y. Kusano, K. Kasuya, T. Inamura, H. Hosoda and S. Miyazaki, "Mechanical Properties of Ti-Cr-Sn Alloys With or Without Additional Elements", *Proc. New Research and Development of Shape Memory Alloy for Advanced Functional and Bio-Materials, SMA Symposium, Association of Shape Memory Alloy, (2009) 22-25*. (oral presentation)

and 11 presentations at Japan Institute of Metals Annual Meeting.

5. Patent

1 application

6. Awards

- 1) Y. Shinohara, T. Inamura, H. Hosoda and S. Miyazaki, The Japan Institute of Metals Best Paper Award, JIM 2009 Fall Meeting, Sept. 16, 2009, "Effect of Zr Addition on Phase Constitution and Mechanical Properties of Ti-Cr-Au Alloys"
- 2) H. Hosoda, The Japan Institute of Metals Meritorious Award, March 28, 2010.

7. Others

- 1) International Conference on Processing & Manufacturing of Advanced Materials (Thermec'2009), Topic Smart / Intelligent Materials & Processing, Coordinator.