

Giant exchange bias in MnPd/Co bilayers

Nam N.T., Phu Thuy N., Anh Tuan N., Nguyen Phuoc N., Suzuki T.

International Training Institute for Materials Science, Hanoi University of Technology, Hanoi, Viet Nam;

College of Technology, Vietnam National University, Hanoi, Viet Nam; Information Storage Materials

Laboratory, Toyota Technological Institute, 2-12-1 Hisakata, Tempaku, Nagoya, 468-8511, Japan

Abstract: A systematic study of exchange bias in MnPd/Co bilayers has been carried out, where the dependences of exchange bias, unidirectional anisotropy constant and coercivity on the thicknesses of MnPd and Co layers were investigated. A huge unidirectional anisotropy constant, $J_K = 2.5 \text{ erg / cm}^2$ was observed, which is in reasonable agreement with the theoretical prediction based on the model by Meiklejohn and Bean. The angular dependences of exchange bias field and coercivity have also been examined showing that both exchange bias and coercivity follow $1 / \cos \theta$ rule. ?? 2007 Elsevier B.V. All rights reserved.

Author Keywords: Giant exchange bias; Magnetic thin films; Unidirectional anisotropy

Index Keywords: Coercive force; Electric potential; Magnetic anisotropy; Magnetic field effects; Manganese compounds; Mathematical models; Anisotropy constant; Bilayers; Exchange bias field; Magnetic thin films

Year: 2007

Source title: Journal of Magnetism and Magnetic Materials

Volume: 315

Issue: 2

Page : 82-88

Cited by: 3

Link: [Scopus Link](#)

Correspondence Address: Nam, N.T.; International Training Institute for Materials Science, Hanoi University of Technology, Hanoi, Viet Nam; email: sd06508@toyota-ac.ti.jp

ISSN: 3048853

CODEN: JMMMD

DOI: 10.1016/j.jmmm.2007.02.203

Language of Original Document: English

Abbreviated Source Title: Journal of Magnetism and Magnetic Materials

Document Type: Article

Source: Scopus

Authors with affiliations:

1. Nam, N.T., International Training Institute for Materials Science, Hanoi University of Technology, Hanoi, Viet Nam, Information Storage Materials Laboratory, Toyota Technological Institute, 2-12-1 Hisakata, Tempaku, Nagoya, 468-8511, Japan
2. Phu Thuy, N., International Training Institute for Materials Science, Hanoi University of Technology, Hanoi, Viet Nam, College of Technology, Vietnam National University, Hanoi, Viet Nam

3. Anh Tuan, N., International Training Institute for Materials Science, Hanoi University of Technology, Hanoi, Viet Nam
4. Nguyen Phuoc, N., International Training Institute for Materials Science, Hanoi University of Technology, Hanoi, Viet Nam, Information Storage Materials Laboratory, Toyota Technological Institute, 2-12-1 Hisakata, Tempaku, Nagoya, 468-8511, Japan
5. Suzuki, T., Information Storage Materials Laboratory, Toyota Technological Institute, 2-12-1 Hisakata, Tempaku, Nagoya, 468-8511, Japan

References:

1. Meiklejohn, W.H., Bean, C.P., (1956) Phys. Rev., 102, p. 1413
2. Nogu??s, J., Schuller, I.K., (1999) J. Magn. Magn. Mater., 192, p. 203
3. Mauri, D., Siegmann, H.C., Bagus, P.S., Kay, E., (1987) J. Appl. Phys., 62, p. 3047
4. Malozemoff, A.P., (1988) Phys. Rev. B, 37, p. 7673
5. Koon, N.C., (1997) Phys. Rev. Lett., 78, p. 4865
6. Ohldag, H., Scholl, A., Nolting, F., Arenholz, E., Matt, S., Young, A.T., Carey, M., St??hr, J., (2003) Phys. Rev. Lett., 91, p. 017203
7. Imakita, I., Tsunoda, M., Takahashi, M., (2004) Appl. Phys. Lett., 85, p. 3812
8. Tsunoda, M., Nakamura, T., Naka, M., Yoshitaki, S., Mitsumata, C., Takahashi, M., (2006) Appl. Phys. Lett., 89, p. 172501
9. Thuy, N.P., Tuan, N.A., Phuoc, N.N., Nam, N.T., Hien, T.D., Hai, N.H., (2006) J. Magn. Magn. Mater., 192, p. 203
10. Kren, E., Kadar, G., (1969) Phys. Lett. A, 29, p. 340
11. Toney, M.F., Samant, M.G., Lin, T., Mauri, D., (2002) Appl. Phys. Lett., 81, p. 4565
12. Ali, M., Marrows, C.H., Hickey, B.J., (2003) Phys. Rev. B, 67, p. 172405
13. Phuoc, N.N., Suzuki, T., (2006) J. Appl. Phys., 99, pp. 08C107
14. Phuoc, N.N., Suzuki, T., (2006) IEEE Trans. Magn., 42, p. 2996
15. Farrow, R.F.C., Marks, R.F., Gider, S., Marley, A.C., Parkin, S.S.P., (1997) J. Appl. Phys., 81, p. 4986
16. Tang, Y.J., Roos, B.F.P., Mewes, T., Frank, A.R., Rickart, M., Bauer, M., Demokritov, S.O., Zhan, W.S., (2000) Phys. Rev. B, 62, p. 8654
17. Seu, K.A., Huang, H., Lesoine, J.F., Showman, H.D., Egelhoff, W.F., Gan, L., Reilly, A.C., (2003) J. Appl. Phys., 93, p. 6611
18. van der Zaag, P.J., Ball, A.R., Feiner, L.F., Wolf, R.M., van der Heijden, P.A.A., (1996) J. Appl. Phys., 79, p. 5103
19. Str??m, V., Jonsson, B.J., Rao, K.V., Dahlberg, D., (1997) J. Appl. Phys., 81, p. 5003
20. Takahashi, M., Yanai, A., Taguchi, S., Suzuki, T., (1980) Jpn. J. Appl. Phys., 19, p. 1093
21. Nogu??s, J., Lederman, D., Moran, T.J., Schuller, I.K., Rao, K.V., (1996) Appl. Phys. Lett., 68, p. 3186
22. Fernandez-Outon, L.E., O'Grady, K., (2005) J. Magn. Magn. Mater., 290, p. 536
23. Sun, L., Searson, P.C., Chien, C.L., (2005) Phys. Rev. B, 71, p. 012417

Download Full Text: [0569.pdf](#)