Abstract Submitted
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Computational Nano-materials Design for Spin-Currents Control in Semiconductor Nano-spintronics[1] HIROSHI KATAYAMA-YOSHIDA, TETSUYA FUKUSHIMA, VAN AN DINH, KAZUNORI SATO, ISIR, Osaka University — We design the different exchange mechanism like Zener's double exchange, Zener's p-d exchange and super-exchange in dilute magnetic semiconductors (DMS) by ab initio calculations. We obtain a universal trend for the exchange interactions [1]. We show that self-organized spinodal nano-decomposition (Dairiseki- Phase) offers the functionality to have high Curie temperatures[2]. We show that spinodal nano-decomposition under layer-by-layer crystal growth condition (2D) leads to quasi-one dimensional nano-structures (Konbu-Phase) with highly anisotropic shape and high T_C[2]. We design a spin-currents- controlled 100 Tera bits/icnh^2, Tera Hz switching, and non- volatile MRAM without Si-CMOS based on Konbu-Phase [2]. In addition to the conventional Peltier effect, we propose a colossal thermoelectric-cooling power based on the adiabatic spin-entropy expansion in a Konbu-Phase [3]. [1] B. Belhadaji et al., J. Phys.-Condens. Matter, 19 (2007) 436227. [2] H. Katayama-Yoshida et al., Phys. stat. sol. (a) 204 (2007) 15. [3] H. Katayama-Yoshida et al., Jpn. J. Appl. Phys. 46 (2007) L777.

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