BILKENT UNIVERSITY

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FACULTY OF SCIENCE

MATERIALS SCIENCE and NANOTECHNOLOGY GRADUATE PROGRAM SEMINAR

"Exchange Bias and Pseude Spin Valves for Spintronic Applications, and Metal Oxide Thin Film for Optical Applications"

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Spin Valve (SV) systems and Magnetic Tunnel Junctions (MTJ) indicating Giant Magneto Resistance (GMR) and Tunnel Magneto Resistance (TMR) consist of two ferromagnetic layers separated by thin metallic or insulating barrier layers [1]. These types thin layered systems are utilized in new generation read heads spin-valve (SV) systems, magnetic random access memories (MRAM) [2], spin transfer torque (STT) and nano oscillator microwave sources. Due to their potential for improvement of power consumption these devices gained great interest of industry in last decade. However, thermal stability of these devices need still to be improved for future applications and consequently they are still being investigated intensively both experimentally and theoretically. Our research is focused to improve the electrical and thermal properties of SV and MTJ systems, namely to reduce the resistance-area (RA) products and increase the thermal and electrical stabilities. Furthermore, in order to increase the signal/noise ratio, besides of lower RA, higher TMR effects are important. For these purpose, our aim is to improve the quality of barrier's and reduce the band gap energies. Another subject about the improvement on MTJ is concerning the exchange bias effect which is crucial for thermal stability of SV based MTJ systems. Due to wide variety of EB types and materials, besides the role of the anisotropy or interface structure, optimum AF film thickness and grain size dependence of the EB field (Hex) and their correlation to <111> texture for a given application are still important controversially questions. We focused our research on to interface order/disorder effects.

Further ongoing research at our research team is focused on improving of optical, electrical and structural properties of nano scale metal oxide thin films, especially vanadium oxide (VOx) which is a desired thin film material for applications like thermochromic and electrochromic coatings, thermoresistive materials, gas sensors and uncooled microbolometers. Within the scope of our studies, less than 100 nm thick and amorphous vanadium oxide thin films were processed to improve electrical, optical and thermal capabilities.

Anadolu University Advanced Technology Thin Film Research Laboratory *at Department of Materials Sciences and Engineering is located in Eskisehir and has two main areas of research interest. These concern spintronics and metallic oxide thin films for spintronic and optical applications.*

REFERENCES

[1] S. S. P. Parkin, C. Kaiser, A. Panchula, P. M. Rice, B. Hughes, M. Samant and S. –He. Yang, Nature Matter, 3, 862 (2004)
[2] K. Kobayashi and H. Akimoto, FUJISU Sci. Tech. J., 42, 39 (2006)

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Tea and cookies will be served after the seminar