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Synthesis of Silver Nanoparticles in Polyelectrolyte Matrix.

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Nowadays, a wide variety of composite materials consisting of polymers containing metal nanoparticles have been extensively investigated to realize their potential applications ranging from optoelectronics to biomaterials. Nanostructured materials consisting of silver nanoparticles (Ag-NPs) embedded in polymeric matrices show physico-chemical, optical and antibacterial properties [1, 2]. A simple method to prepare a AgNP/polyelectrolyte composite was successfully used. Thus, Ag-NPs were obtained through spontaneous formation of nanostructured silver from an Ag2O/polystyrene sulfonate (PSS) solution. The kinetics of Ag-NP-formation was investigated by dynamic light scattering and UV/vis spectroscopy, and related morphology was investigated by X-ray diffraction techniques. The synthesis of the Ag-NP/polystyrene sulfonate composite was performed by mixing a PSS solution in water with a Ag2O solution in diluted ammonia during 48 hours. The nanoparticle size was determined by TEM and SEM.

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Keywords: polymers; silver compounds; nanoparticles

FA2-MS06-P02

Antimicrobial-Coated Surfaces.

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All commonly used implant materials, metals and polymers, seem to present a common problem: bacterial adhesion on their surfaces, mainly S*taphylococci.* The biofilm coated surface is resistant to pharmacological agents as well as host defences [1].

The current revival of silver chemistry in this context, the most powerful antimicrobial and antibacterial inorganic agent used safely in medicine for many years, initiated us to use this metal ion for coating purposes [2].

The combination of molecules derived from silver-polymer compounds and antibiotics would provide additive activity against most micro-organisms and thus the desired protection [3]. We focus on producing a series of newly developed silver-compounds for self-protective surfaces that aim at the prevention of bacterial colonization and eradicate implant associated infections [4]. The new compounds will be characterized by single crystal and powder x-ray analysis.

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Keywords: silver complexes; biomaterials; surface studies

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Structural and Electrical Properties of Specular Spin Valve with CuO_x Spacer.

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The Spin Valve having metal spacer (Cu) layer are showing Giant Magnetic Resistance (GMR) effect. Recent years, it has been reported that IrMn top Spin Valve (SV) as a function of Cu spacer thickness posses a pinning and ferromagnet/antiferromagnet transition [1]. However, this transition has been never observed in bottom SV until now. This transition and temperature dependence [2] have a critical role on the determination of sensor dimension in sensor production and application area. These types of sensors are using as a magnetic read head in 100Gb/in^2 technologies [3]. To realize high sensitivity and use in the 100Gb/in^2 technologies, the enhancement of GMR effect has been intensively investigated. The nano-oxide layer (NOL) in a specular spin valve (SPSV), the electron does not reflect from the NOL and conserve its mean free path of majority spin direction, is fairly effective to increase GMR effect and decrease signal/noise ratio [4]. Nano-oxides layers (NOLs) formed by the partial oxidation of CoFe pinned and free layers [5] results in increase of GMR effect. For the first time in this study, IrMn based bottom specular spin valves Ta (8 nm)/NiFe (8 nm)/IrMn (10 nm)/CoFe (2 nm)/CuOx (x nm)/CoFe (2 nm)/Ta (5 nm) are produced using both DC and Pulsed DC magnetron sputtering methods (DC-MS and Pulsed-DC-MS). The structural properties and electrical properties of these SPSV have been compared. Their structure determined by means of an X-Ray Diffraction, Rocking curve and X-Ray Reflection method, and correlated with its electrical properties measured by Four Point Probe technique. Also, we studied the effect of temperature dependence on the structure and their correlation with the electrical properties of this SPSV systems.

As a result of this study, we observed a ferromagnet/antiferromagnet transitions for the Pulsed-DC-MS deposited SPSV systems at Ar/O_2 ratio of % 15. Furtheremore, structural-electrical property correlations were comparison for SPSV systems deposited using both techniques DC and Pulsed DC.

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Keywords: multilayer thin films; X-ray reflectometry; X-ray rocking curve

FA2-MS06-P04

Thickness Optimization of Underlayer and Seed Layer for Spin Valves. Hakan Cinar[a], R. Mustafa Oksuzoglu[b], Mustafa Yildirim[c]. [a]*Department of Advanced Technologies, Graduate School of Science, Anadolu University, Eskisehir, Turkey.* [b]*Department of Material Science and Engineering, Anadolu University, Eskisehir, Turkey.* [c]*Department of Physics, Graduate School of Science, Anadolu University, Eskisehir, Turkey.*
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In recent years, magnetic spin valves (SVs) have been widely studied in terms of their potential application in high-density magnetic recording and high sensitivity magnetic sensing because of their low field magnetoresistance behavior. It is well known that underlayer and seed layer play significant role in the nanostructure properties of SVs like the preferential crystallite orientation (texture) [1] or to prevent interdiffusion with the substrate [2, 3]. Depending on the SV type (bottom or top) and materials of antiferromagnetic layer as IrMn [4, 5], PtMn [6], FeMn [7] different underlayers were used. Recently, same underlayer and seed layer systems have been investigated for IrMn based Top-SV systems using DC magnetron sputtering deposition (DC-MSD) at different thicknesses. Only in few studies, the IrMn based bottom-SVs were investigated. Kim et al. used Ta(5 nm)/NiFe(2 nm) for IrMn(7.5 nm)/CoFe(3 nm)/Cu(2.5 nm)/CoFe(3 nm)/Ta(5 nm) [4] and Han et al. Ta(3 nm)/NiFe(2 nm) for IrMn(6 nm)/CoFe(3 nm)/Cu(2 nm)/CoFe(3 nm)/Ta(3 nm) [8] SV structure. In both studies DC-MSD technique was used.

In this study, the effects of Ta underlayer, NiFe seed layer and their thickness on the microstructure properties of IrMn based bottom spin valves without spacer and free layer have been investigated. The Pulsed-DC magnetron sputtering technique have been used for the first time in this study to deposit the nano layer systems Ta(5 nm)/NiFe(*x* nm)/IrMn(10 nm)/CoFe (2 nm)/Ta(5 nm) and Ta(*x* nm)/NiFe(5 nm)/IrMn(10 nm)/CoFe(2 nm)/Ta(5 nm) (x = 2, 4, 6, 8, 10 nm) on Si/SiO_2 substrate. Their structural evolution was characterized using X-ray reflectometry, X-ray diffraction and rocking curve methods and electrical properties were determined by four point probe technique. We have found an optimum underlayer and seed thickness combination as Ta(8nm)/NiFe(8nm) with atomic smooth interfaces and reasonable texture for Giant Magnetoresistive type IrMn bottom SVs. Structure-property correlations of IrMn based SVs have been discussed.

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Keywords: multilayer thin films; X-ray reflectometry; X-ray rocking curves

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Influence of Deposition Technique on Growth and Resistivity of Ta/NiFe Nano Films. Ogeday Çapar[a], Mustafa Yıldırım[b], Hakan Çınar[a], Ramis Mustafa Öksüzoğlu[c]. *Department of Materials Sciences and Enginerring, Anadolu University, Eskisehir, Turkey.*
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Recently, soft magnetic NiFe permalloy thin films indicating Anisotropic Magnetoresistance (AMR) and Planar Hall Effect (PHE) [1,2] have attracted considerable attention due to their potential application in antiferromagnetic/ferromagnetic exchange bias in read sensors [3,4], magnetic and biosensors [5,6], and magnetic recording media [7]. DC magnetron sputtering technique (DC-MS) has become one of the most useful technologies to prepare AMR and PHE permalloy films for its high speed and stability [1-11].

In the present study, the correlation between electrical resistivity and nanostructure of Ta/NiFe sub 10 nm films deposited by Pulsed-DC magnetron sputtering have been investigated. Resistivity decreasing was determined , after fixed Ta and increasing NiFe thickness . The results were also comparison and discussed with films deposited by DC-MS technique.

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Keywords: X-ray reflectivity; X-ray diffraction; resistivity

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DFT Modelling of Defects in Strontium Titanate. Matthias Zschornak[a,b], Emanuel Gutmann[a], Hartmut Stöcker[a], Irina Shakhverdova[a], Torsten Weißbach[a], Tilmann Leisegang[a], Dirk C. Meyer[a], Sibylle Gemming[b]. [a]*Institute of Ion Beam Physics and*