Our previous study has shown that ferromagnetic gadolinium silicide (Gd5Si4) nanoparticles (NP) could be potentially efficient T2 CA for MRI with significantly reduced echo time (TE) compared to Superparamagnetic Iron Oxide Nanoparticles (SPION) [1]. T2 CA are defined by their relaxivity, r2, which is dependent on both the saturation magnetization (Ms) and size of the NPs [1,2,4]. In this study, effect of Gd5Si4 NPs of varying sizes and concentrations are investigated on T1, T2 and T2* (effective/observed T2) relaxations times. Gd5Si4 NPs categorized into three fractions (named S1, S2 and S3) based on average sizes of 586 nm, 287 nm and 135 nm respectively as analyzed from SEM images (Fig. 1). XRD analysis on the combined samples shows that Gd5Si4 is the major phase while GdSi and Gd5Si3 are present as the minor phases in all fractions (Fig. 1). Magnetic properties measured in VSM reveal that the Curie temperature (Tc) decreases for Gd5Si4 phase from 312 K for S1 to 304 K for S2 and is undetectable in S3. The M-H curves at 300 K exhibits ferromagnetic behavior descending to paramagnetic as we move from S1 to S3 fraction (Fig. 1). MR data were acquired on the 21.1 T (900 MHz) magnet. The results shown in Table 1 indicate that higher concentrations of NPs shorten the T2 and T2* relaxation times and the contrast disappears rapidly at higher dilutions. The S2 fraction at 1/20 dilution shows notably shortened T1 and T2 relaxation times compared to the other two fractions. Although S1 has higher Gd5Si4 phase volume fraction and larger average particle size compared to S2, further investigation is needed inorder to establish the reason for shortened relaxation times compared to the S1 fraction.
**Abstract:**

Our previous study has shown that ferromagnetic gadolinium silicide (Gd\textsubscript{5}Si\textsubscript{4}) nanoparticles (NP) could be potentially efficient T\textsubscript{2} CA for MRI with significantly reduced echo time (TE) compared to Superparamagnetic Iron Oxide Nanoparticles (SPION) [1]. T\textsubscript{2} CA are defined by their relaxivity, \(r_2\), which is dependent on both the saturation magnetization (Ms) and size of the NPs [1,2,4]. In this study, effect of Gd\textsubscript{5}Si\textsubscript{4} NPs of varying sizes and concentrations are investigated on T\textsubscript{1}, T\textsubscript{2} and T\textsubscript{2}* (effective/observed T\textsubscript{2}) relaxations times.

Gd\textsubscript{5}Si\textsubscript{4} NPs categorized into three fractions (named S1, S2 and S3) based on average sizes of 586 nm, 287 nm and 135 nm respectively as analyzed from SEM images (Fig. 1). XRD analysis on the combined samples shows that Gd\textsubscript{5}Si\textsubscript{4} is the major phase while GdSi and Gd\textsubscript{5}Si\textsubscript{3} are present as the minor phases in all fractions (Fig. 1). Magnetic properties measured in VSM reveal that the Curie temperature (T\textsubscript{c}) decreases for Gd\textsubscript{5}Si\textsubscript{4} phase from 312 K for S1 to 304 K for S2 and is undetectable in S3. The M-H curves at 300 K exhibits ferromagnetic behavior descending to paramagnetic as we move from S1 to S3 fraction (Fig. 1).

MR data were acquired on the 21.1 T (900 MHz) magnet. The results shown in Table 1 indicate that higher concentrations of NPs shorten the T\textsubscript{2} and T\textsubscript{2}* relaxation times and the contrast disappears rapidly at higher dilutions. The S2 fraction at 1/20 dilution shows notably shortened T\textsubscript{1} and T\textsubscript{2} relaxation times compared to the other two fractions. Although S1 has higher Gd\textsubscript{5}Si\textsubscript{4} phase volume fraction and larger average particle size compared to S2, further investigation is needed inorder to establish the reason for shortened relaxation times compared to the S1 fraction.

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PROGRAM

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B1-02. Gilbert damping constant in exchange biased ferromagnetic/antiferromagnetic bilayers. T. Ikubuchi1, T. Moriyama1, H. Mizuno1, K. Oda1 and T. Ono1 1. Institute for Chemical Research, Kyoto University, Uji, Japan

B1-03. Manipulation of spin current in antiferromagnetic insulator. D. Hou1 1. AIMR, Tohoku University, Sendai, Japan

B1-04. Finite Size Effects in Antiferromagnetic Materials. S. Jenkins1, R. Chantrell1 and R.F. Evans1 1. Department of Physics, University of York, York, United Kingdom

B1-05. Field-driven antiferromagnetic domain switching in single crystalline CoO(001) film. J. Xu1, M. Jia2, G. Chen1, Q. Li3, A.T. N’Diaye4, E. Arendt5, and Y. Wu1 1. Department of Physics, Fudan University, Shanghai, China; 2. Fudan University, Shanghai, China; 3. Lawrence Berkeley National Laboratory, Davis, CA, United States; 4. Physics, University of California, Berkeley, Berkeley, CA, United States; 5. Advanced Light Source, Lawrence Berkeley National Laboratory, Berkeley, CA, United States; 6. LBNL, Berkeley, CA, United States; 7. Physics Department, Fudan University, Shanghai, China

B1-06. X-Ray Linear Dichroism for Probing Magnetic Dynamics in the Low-Damping Ferrimagnetic Insulator Yttrium Iron Garnet. J. Bailey1,2, J. Förster1, S. Finizio3, M. Weigand4, J. Grüße5, C. Dubs6, J. Raabe7, G. Aeppli7, G.A. Schütz8 and S. Wintz1 1. Institut de Physique, EPF Lausanne, Lausanne, Switzerland; 2. Paul Scherrer Institut, Villigen PSI, Switzerland; 3. Max Planck Institute for Intelligent Systems, Stuttgart, Germany; 4. INNOVENT e.V., Jena, Germany

B1-07. Spin-orbit torque of PtMn/CoFeB evaluated by extended harmonic Hall measurement. R. Itoh1, Y. Takeuchi1, S. Duttagupta2, S. Fukami1 and H. Ohno1 1. Lab. for Nanoelectronics and Spintronics, RIEC, Sendai, Japan; 2. Center for Spintronics Research Network, Tohoku University, Sendai, Japan; 3. Center for Spintronics Integrated Systems, Tohoku University, Sendai, Japan

B1-08. Probing the Energy Barrier for Resistive Switching in Antiferromagnetic SrIrO3. M.C. Williamson1,2, S. Shen1, G. Cao1, J. Zhou2, J. Goodenough and M. Tsoi2 1. Physics, University of Texas at Austin, Austin, TX, United States; 2. Texas Materials Institute, Austin, TX, United States; 3. Physics, University of Colorado, Boulder, CO, United States

B1-09. Heat Assisted Switching of AFM CuMnAs Memory Cell. Z. Kašpar3, K. Olejník1, V. Novák2 and T. Jungwirth1 1. Academy of Sciences of the Czech Republic, Prague, Czechia; 2. Charles University in Prague, Prague, Czechia; 3. School of Physics and Astronomy, University of Nottingham, United Kingdom


B2-02. Optimization of a Biosensor based on Superparamagnetic Particles-labelling by Electromagnetic Simulation. A. García-Arribas1,2, M. Quintana2, E. Fernández2, J. Fruchtwaengler1, M. Fernández-Guibieda2, J.C. Martínez-García3 and M. Rivas3 1. Departamento de Electricidad y Electrónica, Universidad del País Vasco, UPV/EHU, Leioa, Spain; 2. BCMaterials, Basque Center for Materials, Applications and Nanostructures, Leioa, Spain; 3. Departamento de Física, Universidad de Oviedo, Gijón, Spain

B2-03. T, T and T * relaxations in MRI based on Gd Si nanoparticles of varying sizes. S. Hanagud1, J. Rosenberg2, S.M. Harstad1, S. Gupta1, V. Pecharsky4, A.A. El-Gendy1 and R.L. Hadimani1 1. Mechanical and Nuclear Engineering, Virginia Commonwealth University, Richmond, VA, United States; 2. Florida State University, The National High Magnetic Field Laboratory, Tallahassee, FL, United States; 3. Mechanical and Nuclear engineering, Virginia Commonwealth University, Richmond, VA, United States; 4. Iowa State University, Ames Laboratory, US Department of Energy, Ames, IA, United States; 5. Dept. of Material Science and Engineering, Iowa State University, Ames, IA, United States; 6. Department of Mechanical and Nuclear Engineering, Virginia Commonwealth University, Richmond, VA, United States; 7. Physics, University of Texas at El Paso, El Paso, TX, United States