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Nuclear Polarization of Nanodiamond EWA REJ, DAVID REILLY, School of Physics, The University of Sydney, NSW, 2006 — Nanoparticles with long nuclear spin relaxation times are candidates for use in the context of targeted therapeutic delivery [1] and magnetic resonance imaging [1,2]. We report progress towards the development of contrast agents [3] based on 13C in nanodiamond. Nuclear relaxation and electron spin resonance data is presented for particles produced using detonation and the high-pressure high temperature technique. We describe the development of a milli-Kelvin nuclear polarization setup that makes use of a dilution refrigerator and X-band microwave resonator with fast sample exchange. [1] Huang H., Pierstorff E., Osawa E., Ho D., "Active Nanodiamond Hydrogels for Chemotherapeutic Delivery", Nano Lett, 7, 3305-3314 (2007). [2] Aptekar J.W., Cassidy M. C., Johnson A. C., Barton R. A., Lee M. Y., Ogier A. C., Vo C., Anahtar M. N., Ren Y., Bhatia S. N., Ramanathan C., Cory D. G., Hill A. L., Mair R. W., Rosen M. S., Walsworth R. L., Marcus C. M., "Silicon nanoparticles as hyperpolarized magnetic resonance imaging agents", ACS Nano, 3, 4003-4008 (2009). [3] Manus L. M., Mastarone D. J., Waters E. A., Zhang X., Schultz-Sikma E. A., MacRenaris K. W., Ho D., Meade T. J., "Gd(III)-nanodiamond conjugates for MRI contrast enhancement", Nano Lett, 10, 484-489 (2010).

Ewa Rej
School of Physics, The University of Sydney, NSW, 2006

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