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***NMR Technologies for Monitoring Biological and Geochemical Processes in the Subsurface***

Reducing the negative impact of environmental contamination has become an important issue for society. It is challenging to manage multiple locations where the possibilities of high levels of subsurface contamination exist. A solution to this problem is creating and implementing bioremediation technologies in these areas [1]. Currently, direct sampling of the subsurface requires collecting and sifting through contaminated samples which pose significant safety, regulatory, and cost issues. Because these issues reach the severity they do, an alternative approach using nuclear magnetic resonance, or NMR, is being proposed as an effective monitoring process [2]. High field NMR measurements are capable of detecting biofilm [3]. However, high field NMR is not suitable for biofilm detection in the subsurface due to the high magnetic field susceptibility effects in these materials [3]. Therefore, it has been proposed to use an in-situ NMR machine that will operate at a low field of 300 kHz. A low field instrument was provided on loan from Vista Clara, Seattle, WA. Samples of clean sand and biofouled sand were compared and the NMR relaxation time clearly differentiated between the two samples. This indicates that low field in-situ NMR devices will be able to monitor bioremediation processes.