Photo-CIDNP studies on reaction centers of rhodobacter sphaeroides

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List of Publications

Photochemically induced dynamic nuclear polarization in entire bacterial photosynthetic units observed by ^{13}C- magic-angle spinning NMR.
S. Prakash, Alia, P. Gast, G. Jeschke, H. J. M. de Groot, J. Matysik.
J. Mol. Struc. (2003) 661, 625-633.

Build-up kinetics of light induced nuclear polarization observed in reaction centers of *Rhodobacter sphaeroides.*
S. Prakash, Alia, P. Gast, H. J. M. de Groot, G. Jeschke, J. Matysik.
Photosynthesis: Fundamental Aspects to Global Perspectives (A. van der Est and D. Bruce Eds.), (2004) Allen Press Montreal, pp. 301-303.

^{15}N photo-CIDNP MAS NMR on reaction centers of *Rhodobacter sphaeroides.*
S. Prakash, S. H. Tong, Alia, P. Gast, H. J. M. de Groot, G. Jeschke, J. Matysik.
Photosynthesis: Fundamental Aspects to Global Perspectives (A. van der Est and D. Bruce Eds.), (2004) Allen Press Montreal, pp. 236-238.

Magnetic field dependence of photo-CIDNP MAS NMR on photosynthetic reaction centres of *Rhodobacter sphaeroides* WT
S. Prakash, Alia, P. Gast, H. J. M. de Groot, G. Jeschke, J. Matysik.
J. Am. Chem. Soc. (2005) 127, 14290-14298.

Long-living triplet state of electron donor allows signal separation of cofactors in photo-CIDNP MAS NMR in *Rhodobacter sphaeroides* R26
S. Prakash, Alia, P. Gast, H. J. M. de Groot, J. Matysik, G. Jeschke.
Submitted (2006).

Ground-state electronic structure of special pair in *Rhodobacter sphaeroides* reaction centers revealed by ^{13}C photo-CIDNP MAS NMR.
S. Prakash, Alia, P. Gast, H. J. M. de Groot, G. Jeschke, J. Matysik.
In preparation (2006).

Curriculum Vitae

In May 1996 after finishing my schooling from Kendriya Vidyalaya, Mumbai, I joined St. Xavier's College affiliated to the University of Mumbai. There I followed the bachelor's programme in Mathematics, Physics and Chemistry, and graduated with a specialization in Chemistry in December 1999. The same year I joined the Department of Chemistry at the University of Mumbai to follow the master's programme in Chemistry. During this period I also worked on a short research project, under the guidance of Prof. S.R. Kasturi, at Tata Institute of Fundamental Research, Mumbai to study a peptide in the tubulin protein. In December 2001, I received the master's degree in Physical Chemistry. In April 2002, I started my PhD under the supervision of Dr. J. Matysik in the Solid State NMR group at Leiden University led by Prof. dr. H.J.M. de Groot. During my PhD time, I attended the EMBO course "Multidimensional NMR in Structural Biology" (2002) held at Il Ciocco, Italy. I had the opportunity to present my work through poster presentations at various international conferences. These include the *3rd Alpine conference on solid-state NMR* (2003) in Chamonix, France, the *13th International conference on Photosynthesis* (2004) in Montreal, Canada, *EUROMAR* (2005) in Veldhoven, The Netherlands and the *Spin Chemistry Meeting* (2005) in Oxford, United Kingdom. Also, through talks I presented my work at the *27th Annual Discussion Meeting* of the Gesellschaft Deutscher Chemiker (GDCh) Magnetic Resonance Spectroscopy Division (2005) in Mainz, Germany and at the annual meeting of the *Study group Theory and Spectroscopy* of the Chemical society section of the NWO (2006) in Lunteren, The Netherlands.

Nawoord

Many people have been involved in the work that I have presented in this thesis. I had the opportunity to continue the study of selectively labeled *Rhodobacter sphaeroides* WT reaction centers started by Els Schulten. The knowledge for isolation of reaction centers came from the Biophysics group. In this I was helped by Peter Gast who gave me some of his precious time. I worked with Dre de Wit for growing the bacterial cells. Wouter van der Meer provided a nice atmosphere to work in the lab at the Biophysics group. Since my first year, Alia shared with me her valuable experience through many discussions and suggestions. She helped me with sample preparation and provided me with the selectively labeled reaction center sample used for the study reported in Chapter 4. The patient explanations on the photo-CIDNP theory given by Gunnar Jeschke in Aachen and Bingen not only helped me in understanding the mechanism better but also were extremely useful for designing the experiments. The discussions with Piotr Wawrzyniak and Francesco Buda were useful in formulating an overall picture of the reaction center. Prativa Dawadi was kind enough to provide me with u-^{13}C- *δ-aminolevulinic acid* for reaction center preparations. The discussions on photosynthesis with Prasanna Mohanty were very helpful to me.

On the NMR side, Johan Hollander, Fons Lefeber and Kees Erkelens always gave me their time and help with the solid state NMR setup, initially at the 400 MHz magnet and later at 200 MHz magnet.

In the last four years I have formed many pleasant memories of social interactions with my colleagues: Ania, Arjan, Arjan, Eugenio, Geerten, Karthick, Muhammed, Niels, Piotr, Prashant, Reinier, Richard, Rob, Samira, Swapna, Sylvia, Tatyana, Thierry and Yan. Sitting in the same room as Ido, I learnt a lot about the Dutch politics and history from him. Liesbeth's efficient help in the administrative matters always solved many problems for me. The closest personal and work association has been with my *paranymphs* Anna and Esha. They helped me settle in my apartment and provided me with their company during work.

A very special place belongs to Gerty and Fritz who not only welcomed me to Zirndorf but have always been interested in the progress that I am making.

My coming to Netherlands and taking the first step towards building a scientific career has only been possible due to the constant support from my family. Both my sisters, Ira and Ruchira, have contributed in giving me the best of advice, scientific and otherwise. Through Ruchira, her husband and his parents, I had the pleasure of participating in the unique Dutch 'Sinterklaas' celebration. Finally, it is to my parents that I owe my development as a scientist. They helped cultivate a scientific attitude in me that has formed the foundation of my scientific endeavors.