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Improving the understanding of the properties and retention behaviour of chemically bonded stationary phases employing NMR spectroscopy

Molecular recognition processes are predicted to become the basis of all advanced separation techniques. In solution and recently also in suspension ligand-receptor interactions can be studied using methods of high-resolution (HR) suspended-state NMR spectroscopy, for example by employing the nuclear Overhauser enhancement (NOE) technique or by saturation transfer difference (STD) NMR. We have utilized 2D NOESY techniques together with suspended-state ¹H-NMR spectroscopy to characterize the interactions between silica based chromatographic supports and low-molecular weight compounds.

We will show that suspended-state ¹H NMR spectroscopy and 2D NOESY experiments can be efficiently used to observe interactions between the analyte and the stationary phase as well as the influence of chemical modifications of the silica and the contribution of solvent effects.

The difference NMR technique provides valuable results concerning ligand-receptor interactions by using saturation transfer processes (STD NMR) to detect intermolecular spin diffusion of a macromolecule that strongly interacts with a small ligand. This experiment can be applied to systems with only a small amount of receptor molecules and in most cases with a huge excess of ligand.

Thus, 2D NOESY and saturation transfer difference (STD) NMR experiments can provide valuable information for the design and implementation of novel, task-specific or tailored stationary phases.

Biography

Klaus Albert, professor of chemistry at the University of Tuebingen (Germany) since 1996, performed his studies in chemistry at the Universities of Stuttgart and Tuebingen. He received his diploma in 1973 and his Dr. rer. nat. in 1976 from the University of Tuebingen. His research interests include natural product chemistry, stationary chroma-tographic phases, molecular recognition processes, and the hyphenation of chroma-tographic separation methods with NMR spectroscopy. His current number of peer-re-viewed publications is 260. Since 1987 he is Visiting Associate Professor at the Department of Biochemistry at Tufts University, Boston, USA. In 1999 he was stipend of the Japanese Society for the Promotion of Science. In 2000 he received the "Jubilee Silver Medal" of the British Chromatographic Society and in 2005 the "Andrzej Waksmundzki Medal" of the Polish Academy of Sciences.

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