DOWNLOAD PDF INTRODUCTION TO SOLID-STATE NMR SPECTROSCOPY DUER

Chapter 1 : Introduction To Solid-State Nmr Spectroscopy by Duer, Melinda J

Introduction to Solid State NMR Spectroscopy is written forundergraduate and graduate students of chemistry, either taking acourse in advanced or solid-state nuclear magnetic resonancespectroscopy or undertaking research projects where solid-state NMRis likely to be a major investigative technique.

Editing remarks[edit] Please use correct hyphenation when referring to solid-state NMR, i. Write solid-state NMR spectroscopy if you want to refer to the spectroscopic technique. I know everyone just says solid-state NMR, but that does not actually refer to the spectroscopic technique. Be short and precise: What do we do with that? For reference on the spelling, see e. Organization and References[edit] Beneath other re-structuring and expanding, I re-organized the Reference section a bit, making the "Suggested readings for beginners" a subsection of it, and introducing a subsection "Advanced readings". Hope to see some comments on that. I wonder if the "normal" references called them General should only include those publications which are actually referenced in the text, or also other articles and books. I think it should only be the referenced ones as the name says, a reference, i. This is why I suggest these two as starting points for newbies, together with a few easy-to-read review articles who knows another one or two? Second, I shifted around the History section. I ended up with the idea that an encyclopedia reader first likes to read an introduction, and then needs to know what all these interactions in the solids is about. Having dealt with the NMR in solids, one can now talk about spectroscopy of it. I think the History section can serve as a nice connection between the phenomena and the spectroscopy. The details of the spectroscopy for brevity limited to modern techniques could then follow in the "Modern SSNMR spectroscopy" section. Third, I think some applications would be of interest to someone who wants to look up what solid-state NMR is about. Organization[edit] A nice example on how to organize articles on a complex topic is Baseball. Topics like "Batting" or "Pitching" are summarized, still containing quite some detail, and a link to a main article is given. Maybe one could do that with general concepts like "dipolar coupling" etc. An existing example is Magic angle spinning. References missing[edit] The part under "Methods and techniques" is obviously copied from somewhere, but the references for [Waugh et al.

Chapter 2 : Talk:Solid-state nuclear magnetic resonance - Wikipedia

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Basic concepts[edit] A spin interacts with a magnetic or an electric field. In general, these interactions are orientation dependent. In media with no or little mobility e. In contrast, in a classical liquid-state NMR experiment, Brownian motion leads to an averaging of anisotropic interactions. In such cases, these interactions can be neglected on the time-scale of the NMR experiment. Examples of anisotropic nuclear interactions[edit] Two directionally dependent interactions commonly found in solid-state NMR are the chemical shift anisotropy CSA and the internuclear dipolar coupling. Many more such interactions exist, such as the anisotropic J-coupling in NMR, or in related fields, such as the g-tensor in electron spin resonance. In mathematical terms, all these interactions can be described using the same formalism. Experimental background[edit] Anisotropic interactions modify the nuclear spin energy levels and hence the resonance frequency of all sites in a molecule, and often contribute to a line-broadening effect in NMR spectra. However, there is a range of situations when their presence can either not be avoided, or is even particularly desired, as they encode structural parameters, such as orientation information, on the molecule of interest. High-resolution conditions in solids in a wider sense can be established using magic angle spinning MAS , macroscopic sample orientation, combinations of both of these techniques, enhancement of mobility by highly viscous sample conditions, and a variety of radio frequency RF irradiation patterns. While the latter allows decoupling of interactions in spin space, the others facilitate averaging of interactions in real space. In addition, line-broadening effects from microscopic inhomogeneities can be reduced by appropriate methods of sample preparation. Under decoupling conditions, isotropic interactions can report on the local structure, e. In addition, decoupled interactions can be selectively re-introduced "recoupling" , and used, for example, for controlled de-phasing or transfer of polarization to derive a number of structural parameters. Other interactions such as the quadrupolar interaction can lead to line widths of thousands of ppm due to the strength of the interaction. The first-order quadrupolar broadening is largely suppressed by sufficiently fast MAS, but the second-order quadrupolar broadening has a different angular dependence and cannot be removed by spinning at one angle alone. Anisotropic interactions in solution-state NMR[edit] From the perspective of solution-state NMR, it can be desirable to reduce motional averaging of dipolar interactions by alignment media. Dipolar truncation[edit] The dipolar coupling between two nuclei is inversely proportional to the cube of their distance. This has the effect that the polarization transfer mediated by the dipolar interaction is cut off in the presence of a third nucleus all of the same kind, e. This effect is commonly referred to as dipolar truncation. It has been one of the major obstacles in efficient extraction of internuclear distances, which are crucial in the structural analysis of biomolecular structure. By means of labeling schemes or pulse sequences, however, it has become possible to circumvent this problem in a number of ways. Another way of circumventing dipolar truncation in case of rare nuclei like 13C is to study the systems at their natural isotopic abundance utilising DNP assisted solid-state NMR under magic-angle spinning, where the probability of finding a third spin is almost times lower [2]. Nuclear spin interactions in the solid phase[edit] Chemical shielding[edit] The chemical shielding is a local property of each nucleus, and depends on the external magnetic field. Specifically, the external magnetic field induces currents of the electrons in molecular orbitals. These induced currents create local magnetic fields that often vary across the entire molecular framework such that nuclei in distinct molecular environments usually experience unique local fields from this effect. Under sufficiently fast magic angle spinning , or in solution-state NMR, the directionally dependent character of the chemical shielding is removed, leaving the isotropic chemical shift. J-coupling[edit] The J-coupling or indirect nuclear spin-spin coupling sometimes also called "scalar" coupling despite the fact that J is a tensor

quantity describes the interaction of nuclear spins through chemical bonds. Dipolar coupling NMR Dipolar coupling vectors Nuclear spins exhibit a dipole moment , which interacts with the dipole moment of other nuclei dipolar coupling. The magnitude of the interaction is dependent on the spin species, the internuclear distance, and the orientation of the vector connecting the two nuclear spins with respect to the external magnetic field B see figure. The maximum dipolar coupling is given by the dipolar coupling constant d, d.

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Chapter 4 : Introduction to Solid-State NMR Spectroscopy : Melinda J. Duer :

"Introduction to Solid State NMR Spectroscopy" is written for undergraduate and graduate students of chemistry, either taking a course in advanced or solid-state nuclear magnetic resonance spectroscopy or undertaking research projects where solid-state NMR is likely to be a major investigative technique.

Chapter 5 : Free induction decay - Wikipedia

Solid-state NMR Spectroscopy - An Introduction Rene Verel verelr@calendrierdelascience.com HCI D M. Duer: "Introduction to solid-state NMR", Blackwell Science Ltd (Oxford),

Chapter 6 : Solid-state nuclear magnetic resonance - Wikipedia

By covering solid-state NMR spectroscopy in a clear, straightforward and approachable way with detailed descriptions of the major solid-state NMR experiments focussing on what the experiments do and what they tell the researcher, this book serves as an ideal introduction to the subject.

Chapter 7 : Introduction to Solid-State NMR Spectroscopy

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