
Spin Temperature And Nuclear Spin Relaxation

In Matter Basic Principles And Applications

International Series Of Monographs On Physics

By Dieter Wolf

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'diffusion and nuclear spin relaxation in water technical

June 3rd, 2020 - the diffusion coefficient and the spin lattice relaxation time of protons in ordinary water were measured in the temperature range 0 to 100 deg c using nuclear magnetic resonance free precession techniques"**spin temperature and nuclear spin relaxation in matter**

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'electron and nuclear spin relaxation in an integer spin

May 21st, 2020 - electron and nuclear spin relaxation in an integer spin system tris acetylacetonato mn iii in solution timothy 8ayburt and robert r sharp department o chemistry the university o michigan ann arbor michigan 48109 received 10 november 1989 accepted 9 february 1990'

'breakdown of the nuclear spin temperature approach in

May 4th, 2020 - the physics of interacting nuclear spins arranged on a crystalline lattice is generally described using a thermodynamic framework 1 and the concept of spin temperature in the past experimental"**diffusion and nuclear spin relaxation in water nasa ads**

March 16th, 2020 - the diffusion coefficient and the spin lattice relaxation time of protons in ordinary water have been measured in the temperature range 0 100 c using nuclear magnetic resonance free precession techniques'

'spin temperature university of ljubljana

May 21st, 2020 - spin temperature seminar author stanislav vrtnik adviser professor janez dolin?ek april 2005 absolute temperature is in general positive value last definition of temperature is based on the second law of thermodynamics and a system with a finite number of energy levels or upper limit of energy the absolute temperature can be negative'

'nuclear spin an overview sciencedirect topics

April 4th, 2020 - the nuclear spin lattice relaxation rate r 1 t 1 1 and spin

spin relaxation rate r_2 where t_1 and t_2 account for the longitudinal and transversal relaxation times are parameters depending strongly on the diffusion and fluctuation of the subject nuclear spins carried by the molecules thus the measurements of nuclear spin'

'vanadium nuclear spin lattice relaxation in pi

May 7th, 2020 - shape observed for 1 at ambient temperature is in fact due to irv rh spin spin coupling and that the temperature dependence of the π line shape reflects variations in the rate of π spin lattice relaxation the well defined and rigid geometry of 1 permits a 1 supported by the u s army research office durham grants'

'nuclear spin relaxation in liquid and solid methane

May 6th, 2020 - the deuteron spin lattice relaxation time t_1 and spin spin relaxation time t_2 have been studied in cd 4 and cd 3 h between 55 k and 110 k t_1 was found to increase very slowly with temperature over the entire temperature range for cd 4 with no measurable change being observable at the melting point since the deuteron spin relaxation is produced by intramolecular quadrupolar'

'temperature dependence of the anisotropy of the planar

May 10th, 2020 - of the temperature dependence of the anisotropy the y 56 63 data also show the expected uniaxial anisotropy at high temperature as well as the spin gap suppression of $17t_1$ at 21 over the entire temperature range the relaxation of nuclear spins arises from hyperfine couplings to the imaginary part of the electron spin'

'nuclear spin relaxation in liquids researchgate

May 24th, 2020 - the temperature dependent spin lattice relaxation data of h oh and h ch 3 are presented in the difference in the chemical shifts between the protons in oh groups and the protons in ch groups in'

'temperature dependent nuclear spin relaxation due to

November 16th, 2019 - after presenting the experimental results we describe a putational model for the temperature and concentration dependent nuclear spin relaxation times in which nuclear spin relaxation is driven by fluctuating local magnetic fields produced by flip flop transitions among dipole coupled electron spins'

' T_1 relaxation in nmr spectroscopy uw madison chemistry

June 5th, 2020 - T_1 relaxation spin lattice relaxation gain and loss of magnetization in the z direction nmr lines are at least as wide as specified by the heisenberg uncertainty principle broadening due to inherent lifetime of spin

states the actual width is governed by t_2 for most spin $1/2$ nuclei t_2 is between 0.2 and 50 seconds e^{-t/T_2}

'impurities and nuclear spin relaxation in aluminum nasa ads

March 12th, 2020 - both positive and negative temperature nuclear spin distributions are used to study the nuclear spin lattice relaxation in zero external field at liquid helium temperatures in aluminum with controlled impurity content"chapter 3

June 4th, 2020 - it is possible to change the net magnetization by exposing the nuclear spin system to energy of a frequency equal to the energy difference between the spin states the spin spin relaxation time T_2 the temperature of the human body does not vary by enough to cause a significant influence on T_1

'exchange enhancement of nuclear spin lattice relaxation in

May 16th, 2020 - exchange enhancement of nuclear spin lattice relaxation in antiferromagnets a brooks harris f department of physics university of pennsylvania philadelphia pennsylvania d 104 received 1 january 1969 the nuclear spin lattice relaxation rate in an antiferromagnetic insulator at low temperature is calculated to lowest order in $1/s$

'relaxation effects in nuclear magnetic resonance absorption

May 22nd, 2020 - the measurement of the temperature of the wire as a function of time after switching off the heating current the exact nuclear absorption analog of this experiment has also been carried out and records a striking manifestation of the relaxation process it may be said at once that nuclear spin lattice relaxation times appear to range'

'spin temperature and nuclear relaxation in solids

April 19th, 2020 - 3.12 shows that $1/T_1$ relaxes with a simple exponential law whose time constant T_1 is given by $1/T_1 = \sum_i \rho_{ii}^2 \gamma_i^2 \hbar^2 / (k_B T_1^2)$ spin temperature and nuclear relaxation 4.2.1 second the expression for T_1 involves only diagonal sums of ρ_{ii}^2 and γ_i^2 so that T_1 can be evaluated in the spin temperature approximation even though the solution for the eigenvalues of $\mathbf{X}$ has not been obtained see appendix b 4"spin temperature and nuclear spin relaxation in matter

April 26th, 2020 - spin temperature and nuclear spin relaxation in matter basic principles and applications the international series of monographs on physics wolfgang dieter on free shipping on qualifying offers spin temperature and nuclear spin relaxation in matter basic principles and applications the international series of monographs on physics"spin lattice relaxation

May 30th, 2020 - during nuclear magnetic resonance observations spin lattice relaxation is the mechanism by which the precession of the total nuclear magnetic moment vector which is parallel to the constant magnetic field relaxes from a higher energy non equilibrium state to thermodynamic equilibrium with its surroundings the lattice it is characterized by the spin lattice relaxation time T_1 "spin relaxation of conduction electrons in

semiconductors

April 16th, 2020 - relaxation of conduction electron spins in semiconductors owing to the hyperfine interaction with spin 1/2 nuclei in zero applied magnetic field is investigated we calculate the electron spin relaxation time scales in order to evaluate the importance of this relaxation mechanism master equations for the electron spin density matrix are derived and solved"*nuclear spin lattice relaxation including the spin*

*December 27th, 2019 - the proton and fluorine nuclear spin lattice relaxation times have been measured in a number of liquid substituted benzenes over a wide temperature range in many cases up to and including the liquid vapour critical temperature the relaxation times are"***qubit control limited by spin lattice relaxation in a**

May 8th, 2020 - high spin transition metal plexes are of interest as candidates for quantum information processing owing to the tunability of the pairs of ms levels for use as quantum bits qubits thus the design of high spin systems that afford qubits with stable superposition states is of primary importance nuclear spins are a potent instigator of superposition instability thus we probed the ^4P "*cross relaxation dispersion and temperature dependence of*

May 24th, 2020 - the less known properties of cross relaxation between detectable spins i and fast relaxing spins s such as the two types of h_1 dispersion and the occurrence of two minima of the rotating frame zeeman relaxation time $t_{1x\ i}$ when $\hbar \omega_1 \ll t_{1s} \min \{t_1\}$ or the occurrence of two minima of the dipolar relaxation time $t_{1d\ i}$ when $\hbar \omega_1 \ll t_{1s} \min \{t_1\}$ and $t_{1s} \min \{t_2\}$ is are'

'spin wave contribution to the nuclear spin lattice

May 24th, 2020 - 1 with temperature for two and three dimensional systems the scaling exponents are 3 and 5 respectively we discuss experimental manifestations of the spin wave mechanism of the nuclear spin lattice relaxation doi 10.1103/physrevlett.96.077002 pacs numbers 74.25.nf 74.70.kn 75.30.ds 76.60.es nuclear magnetic resonance nmr is a'

'nuclear spin relaxation in low temperature liquids

March 30th, 2020 - the nuclear spin relaxation time is expressed in terms of the predicted transition probabilities spin relaxation time measurements on $\text{sup } ^{115}\text{In}$ in InSb single crystals at 77 deg K gave an isotropic relaxation time of 0.80 plus or minus 0.05 sec temperature dependence measurements of $\text{sup } ^{127}\text{In}$ in KI at 77 to 800 deg K are reported'

'nuclear spin relaxation in gases and liquids i

April 15th, 2020 - calculation of nuclear spin lattice relaxation times t_1 in liquids and gases involves the correlation functions of the matrix elements between different spin states of the interaction coupling the nuclear spin to other

degrees of freedom of the system the correlation functions are expressed in terms of a time dependent pair distribution function $\rho(r, t)$ for the system'

'supplemental nmr topics michigan state university

June 3rd, 2020 - the efficiency of spin lattice relaxation depends on factors that influence molecular movement in the lattice such as viscosity and temperature the relaxation process is kinetically first order and the reciprocal of the rate constant is a characteristic variable designated T_1 the spin lattice relaxation time in non viscous liquids at room'

'spectral densities and nuclear spin relaxation in solids

June 4th, 2020 - p a beckmann spectral densities and nuclear spin relaxation in solids 89 it to the spectral density the interactions are divided into two types those which are linear in the nuclear spin operators rank one and those which are quadratic in the nuclear spin operators rank two 2 2 rank one spin interactions 2 2 1 the spin rotation"nuclear spin spin relaxation in superconducting mixed

May 10th, 2020 - abstract we have measured the rate of dipole dipole energy relaxation in the mixed state of vanadium and found anomalously rapid relaxation time constants of the order of 10 msec are observed whereas the corresponding relaxation times for nuclear zeeman energy are often of the order of seconds 1 the relaxation rate is generally observed to increase as the magnetic field gradients in the'

'anomalous hyperfine coupling and nuclear magnetic

May 20th, 2020 - okvátovity z simon f amp dóra b 2016 anomalous hyperfine coupling and nuclear magnetic relaxation in weyl semimetals physical review b condensed matter and materials physics vol 94 no 24 245141'

'knight shift and nuclear spin relaxation in fe n gaas

May 23rd, 2020 - for all temperatures measured quadrupolar relaxation limits the spatial extent of nuclear spin polarization to within a bohr radius of the donor sites and is directly responsible for the isotope dependence of the measured nmr signal amplitude knight shift and nuclear spin relaxation in fe n gaas heterostructures christie k d"8 tech 1 relaxation in nmr spectroscopy

June 4th, 2020 - behavior of T_1 and T_2 as a function of correlation time for spin nuclei relaxing by the dipole dipole mechanism ? molecular correlation time the time it takes the average molecule to rotate one radian adapted from bloembergen e m purcell r v pound relaxation effects in nuclear magnetic resonance absorption physical review 1948"the spin temperature theory of dynamic nuclear

June 4th, 2020 - and nuclear spin lattice relaxation by use of the spin

temperature theory has been carried to second order in a perturbation expansion of the density matrix nuclear spin diffusion in the rapid diffusion limit and the effects of the coupling of the electron dipole dipole reservoir eddr with the nuclear spins are incorporated'

'nuclear spin and mri imaio's

June 2nd, 2020 - other nuclei such as ^{13}C ^{19}F ^{31}P ^{23}Na have a net nuclear spin and can be imaged in mri however they are much less abundant than hydrogen in biological tissues and require a dedicated rf chain tuned to their resonance frequency'

'temperature dependence of nuclear spin coherence in e u_3

April 20th, 2020 - we have measured the spin lattice relaxation rate $1/T_1$ of the $1/2 \rightarrow 1/2$ transition of the ^{27}Al nuclear zeeman levels in CeAl_3 at a frequency of 2 095 mhz and temperatures between 0.1 K and 2 K'

'the spin temperature theory of dynamic nuclear

*May 12th, 2020 - a detailed derivation of the equations governing dynamic nuclear polarization dnp and nuclear spin lattice relaxation by use of the spin temperature theory has been carried to second order in a perturbation expansion of the density matrix"***nuclear spin relaxation at ultralow**

temperatures

June 3rd, 2020 - nuclear spin relaxation at ultralow temperatures hiroumi ishii department of material science faculty of science osaka city university osaka 558 8585 japan and low temperature laboratory helsinki university of technology p o box 2200 fin 02015 hut finland pertti j hakonen'

'low temperature nuclear spin relaxation in γ -aluminas

May 29th, 2020 - low temperature nuclear spin relaxation in γ -aluminas solid state communications printed in great britain vol 46 no 6 low temperature pp 437 440 nuclear spin relaxation s g greenbaum naval'

'nuclear spin relaxation in the presence of internal

April 28th, 2020 - in order to elucidate the nature of the stochastic processes which modulate the spin rotation interaction and are thereby responsible for the coupling of the nuclear spin system to the lattice in these molecules both the temperature and the viscosity dependences of the fluorine spin lattice relaxation times in benzotrifluoride as well as the"**use of nuclear spin noise spectroscopy to monitor slow**

January 2nd, 2017 - nuclear spin polarization buildup is a longitudinal relaxation process characterized by a relaxation time constant T_1 which is astronomically slow i.e. in the order of magnitude of 10^7 s below 1 K ^{13}C nanoparticles have been shown to have a huge effect in accelerating spin polarization buildup at very low

temperatures 4 5 these'

'statistical theory of spin relaxation and diffusion in solids

May 26th, 2020 - statistical theory of spin relaxation 217 robertson²⁷ derived an equation of motion for the total magnetic moment of a system containing a single species of nuclear spins in an arbitrarily time dependent external magnetic

field he derived a generalization of bloch's phenomenological equation for a magnetic resonance"

'radiative cooling of a spin ensemble nature physics

June 3rd, 2020 - this approach provides a general route to signal enhancement in electron spin resonance or nuclear magnetic resonance through dynamical

'nuclear spin lattice and nuclear spin spin relaxation time

February 22nd, 2020 - experimental results on the nuclear spin lattice and nuclear spin spin relaxation times in the ferromagnetic eub₆ at temperatures below 4.2 K are presented using the external magnetic field H_{ext} in the range of 0 to 10 kG nuclear spin spin relaxation time $\tau_{1\rho}$ on the basis of the suhl nakamura process turns out to be 3.2 μ s which agrees well with the experimental value 11'

'room temperature hyperpolarization of nuclear spins in

February 29th, 2020 - the spin lattice relaxation time of the ¹H spins in the p terphenyl h₁₄ host crystal τ_1 was 11 min at room temperature the ¹H spin lattice relaxation was mainly due to the pendulum motion of the central benzene ring which modulates the local dipolar field of the ¹H spins in and near the central ring 20'

'dynamic nuclear polarization

June 5th, 2020 - dynamic nuclear polarization dnp results from transferring spin polarization from electrons to nuclei thereby aligning the nuclear spins to the extent that electron spins are aligned note that the alignment of electron spins at a given magnetic field and temperature is described by the boltzmann distribution under the thermal equilibrium it is also possible that those electrons are'

'spin lattice relaxation chemistry libretexts

June 2nd, 2020 - introduction spin lattice relaxation more commonly referred to as τ_1 is the time it takes for the bulk magnetization of the sample to recover 63 along the external magnetic field axis from the x-y plane this section will be devoted to more intense aspects of spin lattice relaxation including relaxation mechanisms relaxation theory and how to measure τ_1 processes'

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