

纳升级生物样品核磁共振微检测高信噪比平面螺旋微线圈的设计

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摘要:

论述了纳升级生物样品核磁共振微检测技术中, 高信噪比平面螺旋微线圈的设计方法及结果, 介绍了这种检测技术的优点与缺点, 并提出了改进方法。论述了核磁共振平面螺旋微线圈检测方法的理论基础, 推导出自由感应衰减信号的信噪比与线圈几何参数的数学关系, 利用matlab软件对信噪比进行了仿真, 得到了最优信噪比条件下的线圈几何参数值, 同时计算出相应的品质因数。最后, 概括了平面螺旋形微线圈几何参数设计的一般原则。

关键词: 核磁共振波谱 纳升级生物样品检测 平面螺旋形微线圈 信噪比

Design of planar spiral microcoil with high SNR for nL biological sample in NMR detection

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Abstract:

The method and results for design of planar spiral microcoil with high SNR for nano-liter sample in NMR detection is presented. The advantages and disadvantages for application of microcoil in NMR experiment as well as how to improve performance of microcoil have been discussed. The base principle for micro-scale NMR spectroscopy is introduced. The relationship between signal-to-noise ratio and microcoil geometry has been deduced, which is used as the guide for microcoil design. The simulation of SNR of free induction decay in NMR experiment has been done by implementing a Matlab script. Then the optimal parameter of microcoil geometry is found out. Finally general suggests have been summarized.

Keywords: NMR spectroscopy; detection for nL biological sample; planar spiral microcoil; Signal-to-noise ratio

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