

## 双转子中子散射飞行时间谱仪

@李际周\$中国原子能科学研究院!北京 102413 @叶春堂\$中国原子能科学研究院!北京 102413 @金余恒\$中国原子能科学研究院!北京 102413 @李竹起\$中国原子能科学研究院!北京 102413 @杨大华\$中国原子能科学研究院!北京 102413 @康健\$中国原子能科学研究院!北京 102413

收稿日期 1991-8-24 修回日期 网络版发布日期:

**摘要** 在中国原子能科学研究院的重水研究性反应堆上设计建造了一台双转子中子散射飞行时间谱仪。该谱仪采用高速同步双转子(最高转速为15000r/min)系统,并在90°角范围内配置54支<sup>3</sup>He管(可扩展为108支)记录散射中子,散射中子讯号由飞行时间编码单元编码后送入DG-10/SP微机数据获取系统,该系统采用了通用智能接口并具有实时显示54路谱的功能。该谱仪还在转子本体中填入大量含硼含氢物质,在费米转子准直系统中采用超薄(0.025 mm)钆(Gd)片作为芯片,既增强了准直效果,又使转子系统屏蔽快中子本底的能力增强10倍,解决了径向水平孔道本底高的困难。谱仪指标:单能入射中子能量范围5 200 meV,分辨率AE/E~(3—8)%,样品上单色中子强度~10~3S~1·cm~2。信号本底优于20:1,在转速为13000r/min时连续工作10 d,相位及速度漂移均不大于0.04%。

**关键词** [中子散射谱仪](#) [双转子](#) [飞行时间](#) [热中子非弹性散射](#) [声子谱](#)

分类号

## A DOUBLE CHOPPER SYSTEM NEUTRON SCATTERING TIME-OF-FLIGHT SPECTROMETER

LI JIZHOU YE CHUNTANG JIN YUHENG LI ZHUQI YANG DAHUA KANG JIAN (China Institute of Atomic Energy. P. O. Box 275-30. Beijing. 102413)

**Abstract** A double chopper system neutron scattering time-of-flight spectrometer is built and installed at the Heavy Water Research Reactor (HWRR) of China Institute of Atomic Energy in Beijing with the purpose of phonon measurement using neutron inelastic scattering technique. The two choppers are rotated in a synchro way (the highest speed is 15000 r/min). Scattering neutrons are detected by 54 <sup>3</sup>He counters, distributing in an angle region of 90°. The total number of the <sup>3</sup>He detector will be extended to 108 in future. Neutron signals from <sup>3</sup>He detectors are coded by a time-of-flight coding system and then transferred to the data acquisition system of DG-10/SP micro-computer. An universal intelligent interface was used in the data acquisition system, which has the function of displaying the real time spectrum separately for each counter. Boron containing resin is filled in the chopper body, thus increasing anti fast neutron background ability of this system by a factor of 10, and enabling the spectrometer to be used on the radial experimental channels of the HWRR. In addition, Gd foil of 0.025 mm is used as the material for the collimation system within the core of the Fermi chopper, which also strengthens the collimation efficiency and reduces the background due to the large neutron absorption cross section of Gd. The technique specifications of the spectrometer are as following: energy region of monochromatic incident neutrons: 5—200 meV; resolution:  $\Delta E/E \sim (3-8)\%$ ; monochromatic neutron flux at sample position:  $\sim 10-3 \text{ s}^{-1} \cdot \text{cm}^{-2}$ ; signal to noise ratio: better than 20: 1; phase and speed shift of the chopper system for a 10 day non-stop operation at 13000 r/min less than 0.04%.

**Key words** [Neutron scattering spectrometer](#)[Double chopper system](#)[Time-of-flight](#)[Thermal neutron inelastic scattering](#)[Phonon spectrum](#)

### 扩展功能

本文信息

▶ [Supporting info](#)

▶ [\[PDF全文\]\(451KB\)](#)

▶ [\[HTML全文\]\(0KB\)](#)

▶ [参考文献](#)

服务与反馈

▶ [把本文推荐给朋友](#)

▶ [文章反馈](#)

▶ [浏览反馈信息](#)

相关信息

▶ 本刊中 [包含“中子散射谱仪”的相关文章](#)

▶ [本文作者相关文章](#)

