

用于X射线荧光分析的 SDD探测器读出系统

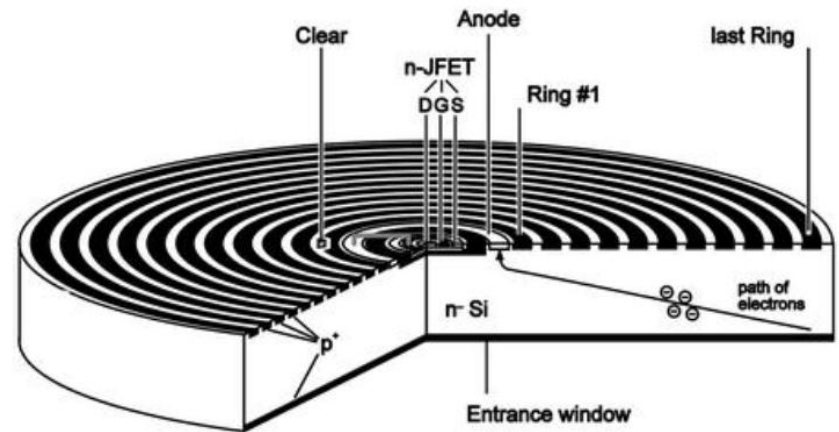
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提綱

- ▶ SDD探测器
- ▶ 探测器读出系统
- ▶ 应用项目

SDD探测器

- ▶ 高阻硅材料作为探测器基体
- ▶ 双面植入 p^+ 接触，使基体被全部耗尽
- ▶ 将 n^+ 接触做的非常小作为阳极（收集电极）

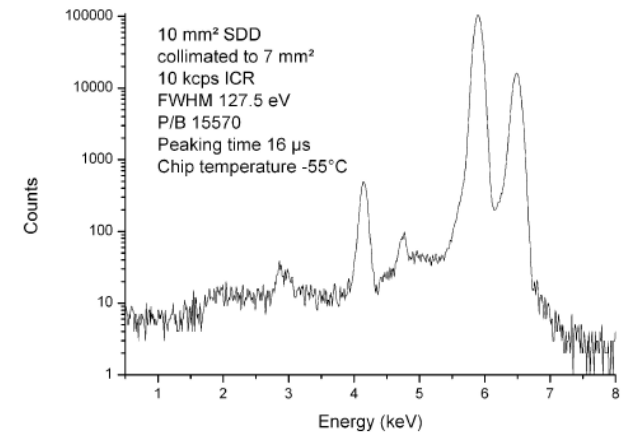


SDD探测器

- Very good energy resolution and P/B
- High thermal budget: $\Delta T > 75\text{ K}$
- Operable at up to $+50\text{ }^\circ\text{C}$ ambient temperature with excellent performance
- High count rate capability up to 500 kcps
- Efficient integrated Peltier element
- Radiation hardness during more than 10 years standard count rate exposure
- 'easy to use' – no voltage adjustments
- Premium and Standard class available

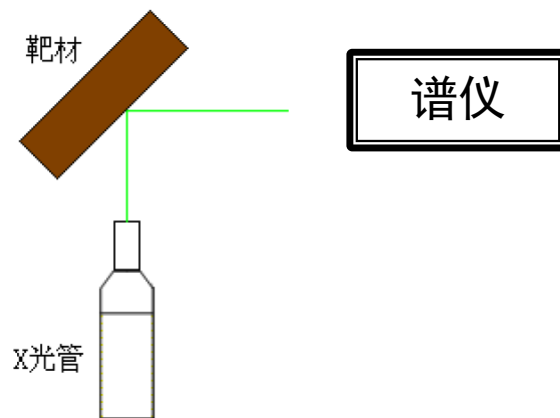
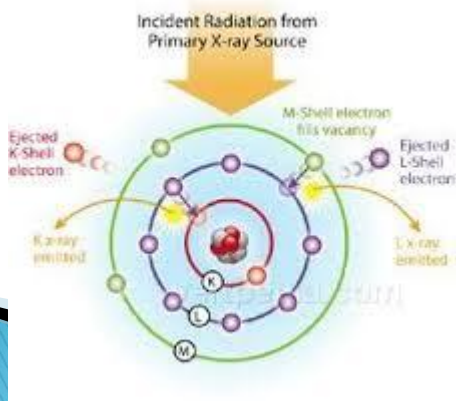


▶ **FWHM: $< 139\text{ eV}@5.9\text{ keV}$**



X射线荧光

- ▶ X射线荧光分析法是高精度的定量分析法，可以进行多元素同时测量（如Mg, Al, Si等），是分析化学的重要分析手段之一。
- ▶ 基于能量色散（Energy Dispersive）方法的X射线荧光光谱仪，分为主动式（自带X射线源、X光管），被动式（依靠环境，如太阳X射线）；



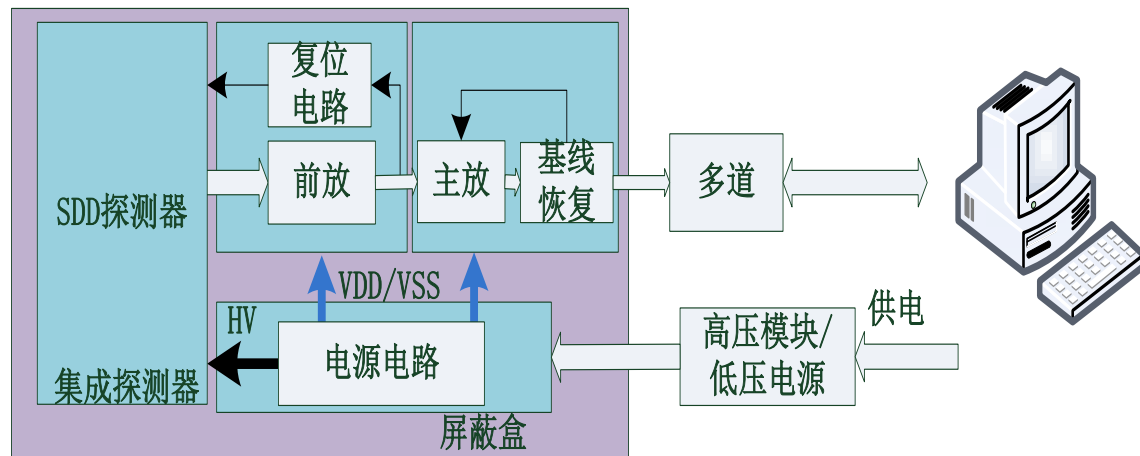
探测器读出系统

- ▶ SDD正常工作要求：
偏压：-130V、
-20V、 -65V；
reset放电；
- ▶ 高能量分辨率探测
- ▶ 小体积读出电路

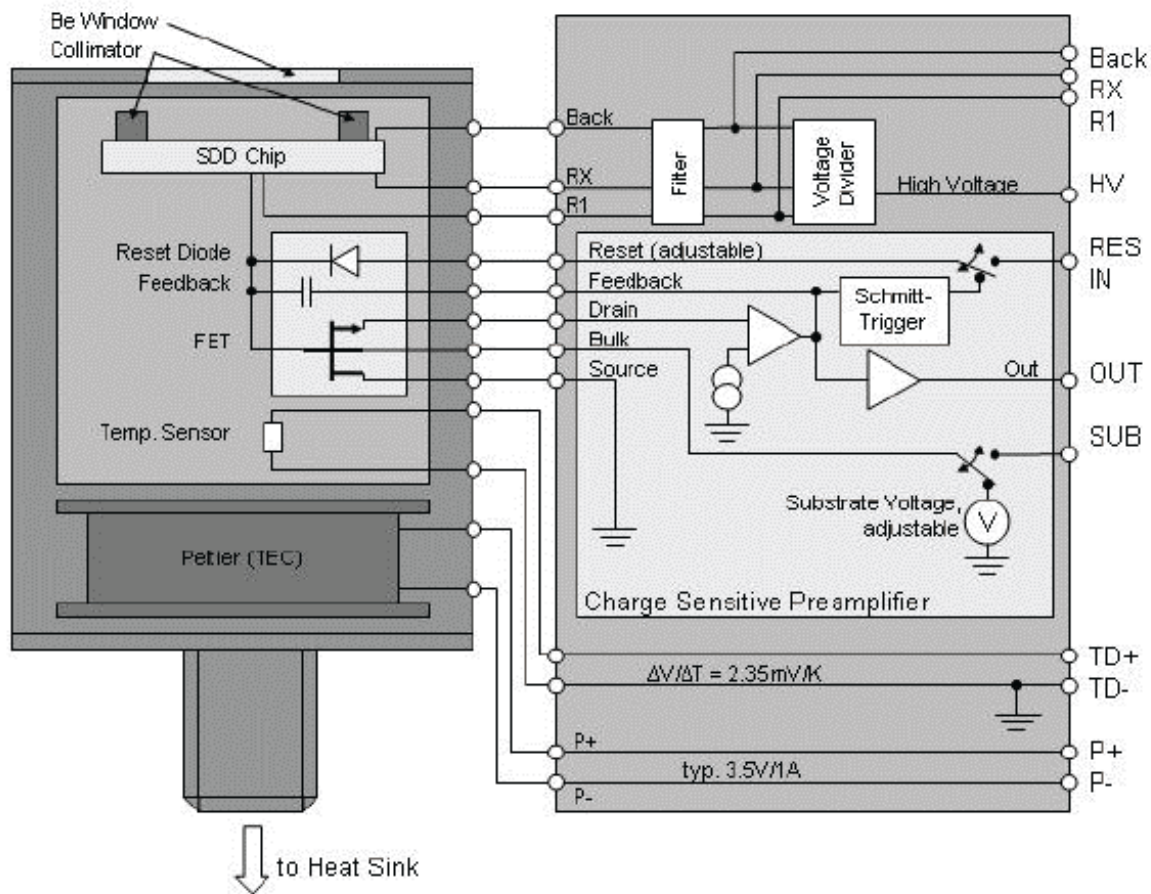
- ✓ 信噪比高
- ✓ 集成度高；
- ✓ 结构设计紧凑

探测器读出系统

- ▶ 前置放大器;
- ▶ 复位电路;
- ▶ 主放;
- ▶ 基线恢复;
- ▶ 电源电路



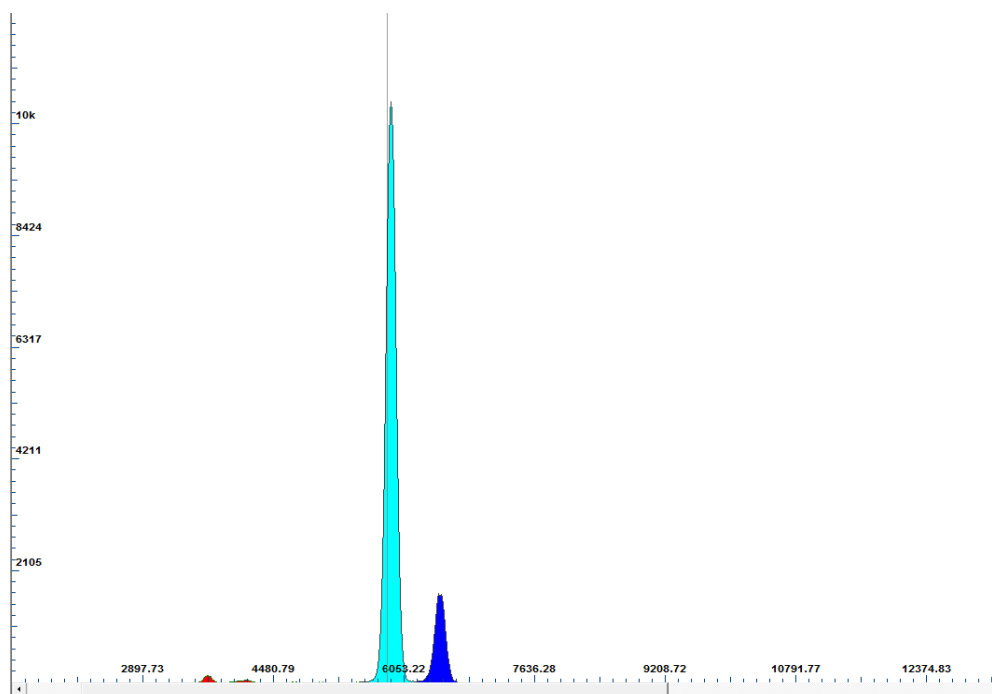
探头和前放



1. 前置FET
2. 电荷灵敏前放
3. 使用二极管放电
(锯齿波)
4. 内置制冷
5. 温度监控

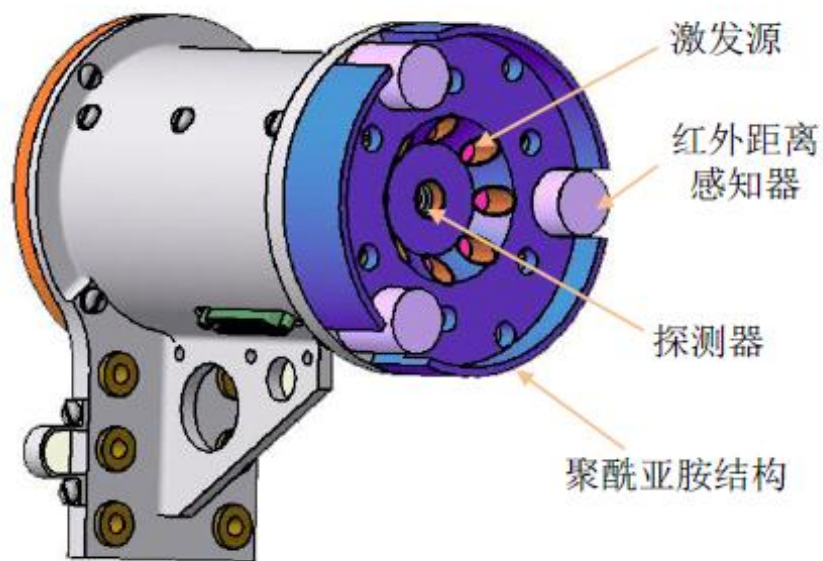
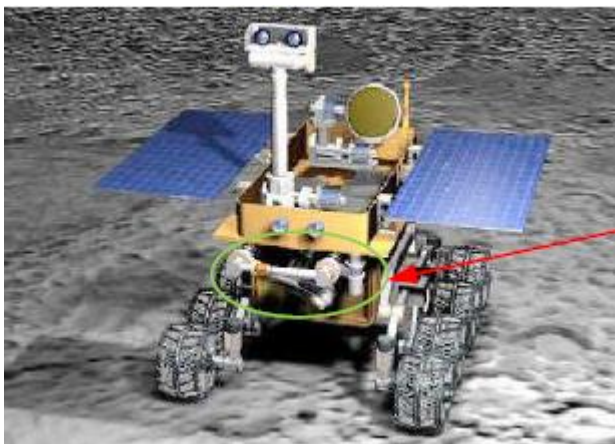
Fe55测试结果

FWHM: 134.2@5.9keV

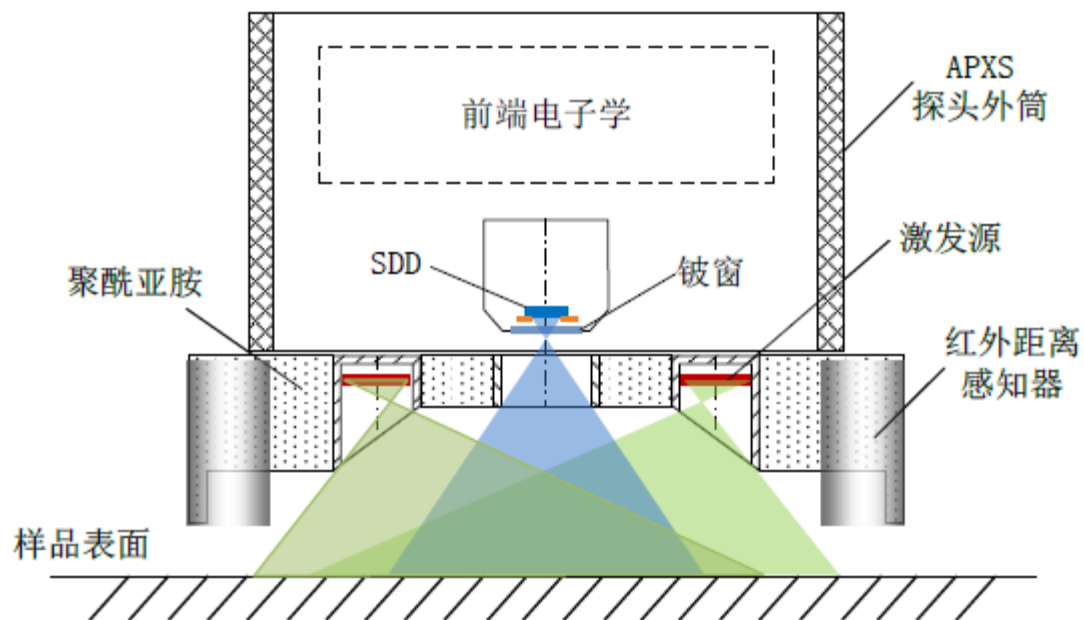


应用

▶ APXS: 粒子激发X射线谱仪

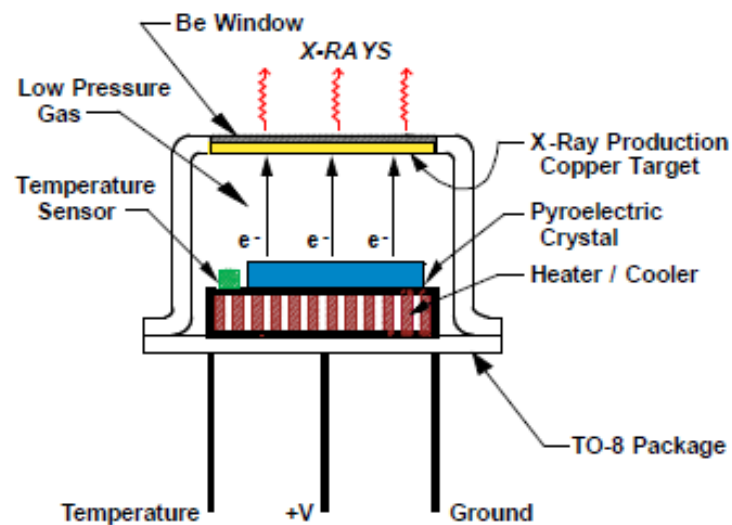
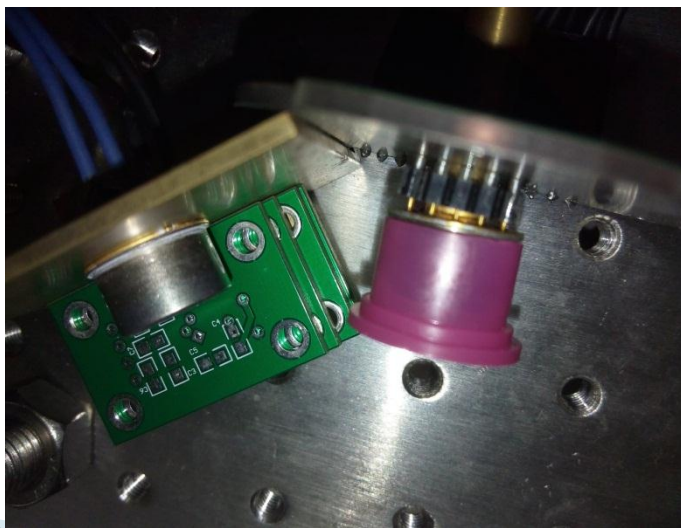


APXS工作原理

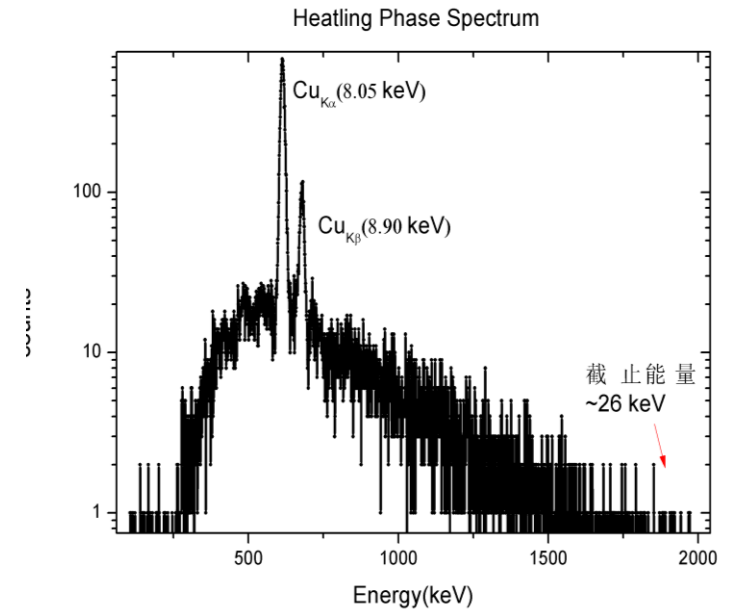
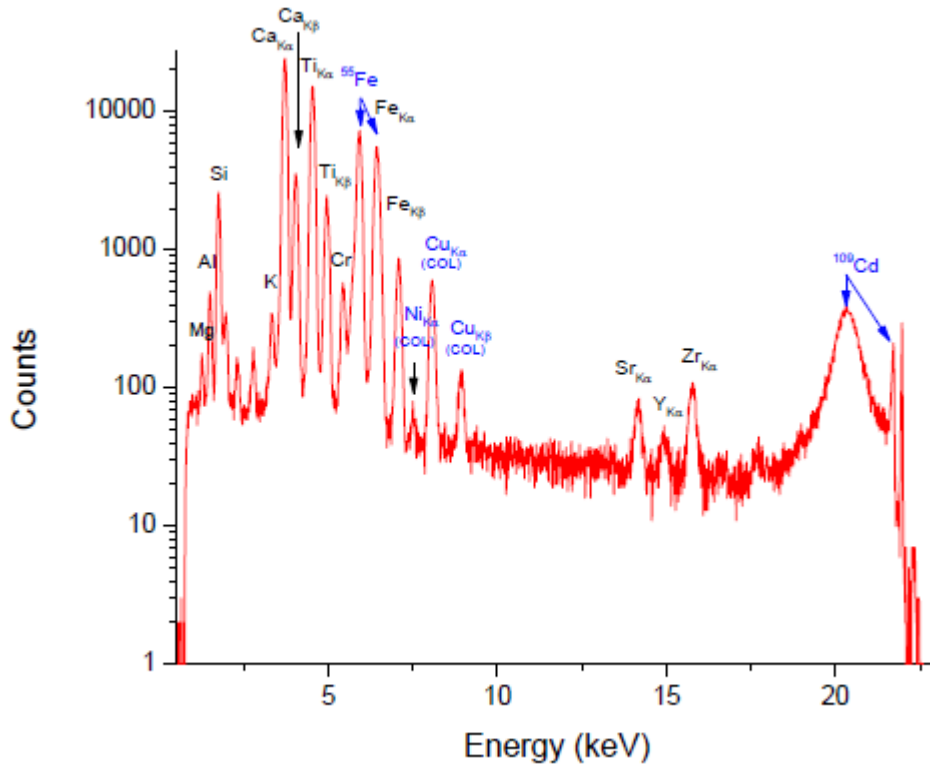


热释电X射线产生器

- ▶ 热释电效应
- ▶ 温度改变
- ▶ 靶材



测试结果



THANK YOU!