**班号\_\_\_\_\_\_\_\_\_\_\_ 学号\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 姓名\_\_\_\_\_\_\_\_\_\_\_\_ 教师签字\_\_\_\_\_\_\_\_\_\_\_\_**

**实验日期\_\_\_\_\_\_\_\_ 组号\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 预习成绩\_\_\_\_\_\_\_\_\_ 总成绩\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**实验名称** **霍尔效应传感器和各向异性磁电阻传感器**

1. **实验目的**
2. **实验预习**

**1.** 如何利用霍尔效应测量磁场？

2. 霍尔电压测量中存在哪些系统误差？用什么方法消除这些误差？

3. 各向异性磁阻：

1. **实验现象及数据记录**

1． 测量*VH-IM*关系  *Is*=5.000mA

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *IM*（A） | *B*（mT） | *V1*（mV） | *V2*（mV） | *V3*（mV） | *V4*（mV） |  |
| *+IM,+IS* | *-IM,+IS* | *-IM,-IS* | *+ IM,-IS* |
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2. 测量*VH-IS*关系 *IM* =0.500A

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *IS*（mA） | *V1*（mV） | *V2*（mV） | *V3*（mV） | *V4*（mV） |  |
| *+IM,+IS* | *-IM,+IS* | *- IM,-IS* | *+IM,-IS* |
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**3.测量*VH-X*关系 *IM*=0.500A *Is=*5.000mA**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***x*(mm)** | ***V1*（mV）** | ***V2*（mV）** | ***V3*（mV）** | ***V4*（mV）** |  | ***B*(mT)** |
| ***+IM,+IS*** | ***-IM,+IS*** | ***- IM,-IS*** | ***+IM,-IS*** |
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4. AMR的 *Vout-IM* 关系 *VS*=4.00V

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *IM*(mA) | *B*(Gs) | *Vout*(mV) | *IM*(mA) | *B*(Gs) | *Vout*(mV) |
| 600 |  |  | -50 |  |  |
| 550 |  |  | -100 |  |  |
| 500 |  |  | -150 |  |  |
| 450 |  |  | -200 |  |  |
| 400 |  |  | -250 |  |  |
| 350 |  |  | -300 |  |  |
| 300 |  |  | -350 |  |  |
| 250 |  |  | -400 |  |  |
| 200 |  |  | -450 |  |  |
| 150 |  |  | -500 |  |  |
| 100 |  |  | -550 |  |  |
| 50 |  |  | -600 |  |  |
| 0 |  |  |  |  |  |

5. AMR的 *Vout-θ*关系 *VS*=4.00V、*IM*=150mA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *θ*（°） | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| *Vout*（mV） |  |  |  |  |  |  |  |  |  |  |
| *θ*（°） | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |  |
| *Vout*（mV） |  |  |  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **教师** | **姓名** |
| **签字** |  |

1. **数据处理及作图**

画*VH*-*IM*和*VH-IS*曲线，用最小二乘法计算斜率*K*，计算霍尔元件灵敏度*KH*；

画*B*-*X*图，描述螺线圈内*X*方向上*B*的分布特征;

作出*Vout-B*关系曲线，并取在线性范围（±6Gs）内数据，根据公式计算各向异性磁阻传感器的灵敏度SA;

作各向异性磁阻传感器的*Vout-θ*关系曲线，确认输出电压与转角的关系。

1. **讨论问题**

1. 如何根据*B*、*IH*和*UH*方向判断霍尔片的导电类型（*N*或*P*型半导体），要求画图说明。（注：*N*型半导体中，载流子为电子；*P*型半导体中将载流子视为正离子）；

2. 估算本实验所用霍尔片的载流子浓度。