传感技术学报
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基于纳米晶软磁合金的电感式应变花的研究

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摘　要：

利用纳米晶软磁合金良好的压磁特性，设计了一种用于测量平面应力的电感式应变花。首先，介绍了这种应变花的结构和工作原理，并推导出其输出数学模型。其次，进行了可行性试验。试验表明，应变花每一测量轴的输出电压主要取决于该测量方向的应变，其灵敏度可达3.86mV/με，线性度为1.03%F.S，重复误差与迟滞误差均小于1% F.S。在平面应力状态时，不同方向应变相互耦合对测量精度的影响，通过标定补偿灵敏度系数对应变花的输出加以修正。与传统的电阻式应变花相比，这种电感式应变花具有结构简单，工作可靠，使用寿命长，适应性强，灵敏度和测量精度较高等特点。

关键词：应变花 纳米晶软磁合金 压磁效应 电感原理

Research on Inductance Strain-Gage Based on Nanocrystalline Soft Magnetic Alloy

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Abstract:

A new strain-gage which can be used for measuring two-dimensional stress based on inductance principle was discussed , and it was made of nanocrystalline soft magnetic alloy. The principle and structure of the strain-gage were presented, and its output characteristic equation was derived. By making a measuring experiment, It is show that the output voltage in any gauging spindle of the strain-gage be decided by strain in same direction with gauging spindle, and its measuring sensitivity and linearity is respectively 3.86mV/με，1.03%F.S. When it was used to measure two-dimensional stress, the effect on measurement accuracy from mutual interaction in difference direction strain can be revised by demarcating a sensitivity compensation coefficient. Comparing with a resistance strain gauge, the inductance strain gage has some characteristic as simple structure, reliable performance, long life, strong adaptability, higher sensitivity and accuracy.

Keywords: strain-gage ; nanocrystalline soft magnetic alloy；magneto-elastic effect；inductance principle

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