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Sral2O4: EU2Dy3Of Pressure Sensitive afterglow luminescence Performance Study

Di Hou

University Of Chongqing, Shijiazhuang, Hebei Province, 050000

Abstract: This paper on Long Afterglow Material$Sral_2O_4$: EU^2Dy^3In low gas pressure(0 ~ 300000 PA)Hold up a of afterglow strength changes the system to studyFound for same of Gas PressureAfterglow brightness of response situation with pressure time point of change differentAnd in100 ~ 260 sBetween sensitivity with the start time of delay and increaseHas is good regularity.In0 ~ 300000 PaPressure range in$Sral_2O_4$: EU^2Dy^3Of afterglow strength change situation and gas pressure change value linear related and sensitivity is high.We think$Sral_2O_4$: EU^2Dy^3As an new pressure sensitive luminescence material in non-contact pressure field has good of Application Prospect.

Keywords: Long Afterglow MaterialPressure SensorDefect Luminescence

1. Introduction

Rare earth long afterglow luminescence material preparation simple, chemical stability high

As an sensing material in pressure measurement, biological medical, temperature measurement, work Surface Pressure Distribution Measurement is Aviation Aircraft Design in very importantIndustry flaw detection, earthquake prediction and monitoring and field has a certain of research-based Component of the part[1 ~ 10].In wind tunnel experimental stage pressure sensitive coating(PSP)Pressure Basis[22 ~ 33].But as of nowThe rare earth long afterglow material in negative pressure range

Technology is measurement surface pressure distribution when the most intuitive effective of a kind of technology In the pressure sensitive Luminescence Performance of research reports is less.This paper on long more

Means[11 ~ 15].Now commonly used of pressure sensitive coating main by fluorescence probe and Viscosity Hui MaterialSral2O4: EU2Dy3In Gas Pressure Under of afterglow Strength Variable Mixture two partBy measurement different oxygen partial pressure under material of luminescenceOf phenomenon the system to studyFound in different of afterglow attenuation order Strength or life of change to calculation corresponding of pressure.Improve pressure sensitive coating ParagraphAfterglow luminescence of gas pressure change of sensitive degree differentThe

Performance of way main have two: (1)Design by Precious Metals With of Group Determine the long afterglow material for gas pressure test of optimal attenuation Area Into the more efficient of oxygen sensitive fluorescence probe; (2)By the polymer Between;Concurrent now0 ~ 300000 PaOf environment pressure change rangeThe rest of

Adhesive of composition and structure the optimization to Improve Oxygen exchange efficiencyInto Hui qiang of change has a very good regularity and sensitivity.Different in existing

And improve the pressure sensitive coating of measurement accuracy, shorten the response time[16 ~ 21].Now

Pressure sensitive paint of oxygen quenching Principle Rare earth long afterglow material of pressure sensitive luminescence only Have pressure sensitive coating there the preparation process complex, cost high, is not easy to storage And environment pressure change about And gas style.In non-contact measurement

And shortcomings. Pressure Field has good of Application Prospect.

2. Experimental part

2.1 Sample Preparation

Will Laboratory Preparation$Sral_2O_4$: EU^2Dy^3Material grinding50 ~ 100 mu m,And and polyethylene glycol by mass ratio2:1Join ethanol solution stirring after drop to sample slot in60 ℃ DryingAfter Will samples slot fixed in samples warehouse in to be measured.

2.2 Test Equipment

Test Device main by power adjustable UV Lamp(Excitation light source), Pressure controller(PACE5000,General ElectricAmerican), Signal collector(Photoelectric multiplier Tube: H11461P-01,Japanese hamamatsu electronic;Photon Counting Unit: C9744,Japanese hamamatsu electronic;Photon Counting Module: C8855-01,Japanese hamamatsu electronic)And samples warehouse four part(Figure1).

2.3 Test Methods

Will samples warehouse smoke to vacuum after with UV lamp saturated excitation Samples5 min,Then close Light Source.In sample afterglow Attenuation Process in by pressure controller rapid change sample pressure"With signal collector record afterglow luminescence SignalTo get different pressure change process in afterglow strength of change situation.

3. Results and discussion

Figure2In given.$Sral_2O_4$: EU^2Dy^3In0 Pa (Pressure controller numerical)Environment pressure under Saturated excitation afterThe attenuation to different time

PointMake samples warehouse in pressure from0 Pa (Pressure controller numerical)Fast1 MPa,Measured afterglow strength change curve.From the group data in can seeIn the same of pressure change hold upMaterial in different of attenuation stage afterglow of Strength Change(I_{Peak}-I)Has different.

According to force afterglow luminescence mechanism(Figure3)[34]The external pressure of increase the afterglow material trap in electronic accelerated releaseTo leadEU^2Luminescence Center get energy of speed improve and make material of afterglow brightness enhance.From figure2In can seeIn different afterglow attenuation stage are subject to the same external gas pressure change influence whenAfterglow strength of change of not fixed valueBut first with time of after and increase then and gradually reduce the process.It can be further speculated that$Sral_2O_4$: EU^2Dy^3Afterglow strength in the same gas pressure change hold up a strength change of different of reason is because afterglow material internalEU^2Luminescence Center quantity fixedIn attenuation early by pressure after trap release of Electronic can't efficient to and luminescence center combinedSome electrons lose energy in the form of non-radiative transitions..As attenuation proceeds,Reduced number of free electrons,

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