(12) UK Patent Application (19) GB (11) 2 092 870 A

(21) Application No 8103714
(22) Date of filing 6 Feb 1981
(43) Application published 18 Aug 1982
(51) INT CL[3] G01T 1/11
(52) Domestic classification
H5R 6
C4S 311 59Y 604 606 616 626 62X 703 705 709 70Y 712 716 720 74Y 75Y 76Y
(56) Documents cited
GB 1061535
(58) Field of search
H5R
C4S

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(54) **Acid dip for dosmeter**

(57) Background signal in a PTFE based dosemeter caused by impurities in the PTFE and in the active component such as lithium fluoride is substantially reduced by treating the dosemeter with acid the background signal.

The optimum treatment involves use of hydrofluoric acid at room temperature for approximately one minute, followed by thorough washing with methanol, and finally drying.

This treatment is best applied after the original manufacture of the dosemeters. It may also be applied to existing dosemeters after they have been in use for some time.

The treatment produces a permanent effect in reducing both the light induced signal and the non-light induced signal. The process may be applied to all types of dosemeter manufactured from PTFE or other plastics or resins which are able to resist brief exposure to acid.

The treatment works particularly well with dosemeters based on PTFE and lithium fluoride. It is also applicable to dosemeters based on calcium sulphate, lithium borate and magnesium borate.

Acids which may be used include hydrofluoric, hydrochloric, nitric, phosphoric and sulphuric.

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SPECIFICATION

Acid dip for dosemeter

Dosemeters based on PTFE (polytetrafluoroethylene) incorporating an active component, such as lithium fluoride, are well known. One particular type of dosemeter using PTFE and lithium fluoride is made by mixing PTFE powder with the lithium fluoride so as to form a homogeneous mixture and then making rods of the mixture by compressing and sintering. Discs are then machined from the solid rod so as to produce a dosemeter in which the lithium fluoride is uniformly dispersed in the PTFE.

Such dosemeters are described, for example, in Teledyne Isotopes Incs., U.K. Patent No. 1,140,028.

Other types of dosemeter based on PTFE and lithium fluoride employ a layer of PTFE with a granular layer of lithium fluoride on it.

When a thermoluminescent dosemeter is in use and a source of radiation such as a radioactive isotope is emitting radiation, the radiation falls on the dosemeter and a proportion of the radiation is trapped in the form of a charge in defects or "traps" in the crystal lattice. When measuring the amount of radiation trapped by a dosemeter, the dosemeter is heated up, the trapped charge becomes free and recombines at other defects to emit light. The light emitted is then measured by a photomultiplier tube to indicate the degree of charge and therefore the degree of radiation to which the dosemeter has been subjected.

Measurement of the radiation is made difficult by various background signals which are generated during the readout.

These intereference signals have previously been a drawback of dosemeters based on PTFE.

An object of the present invention is to provide a method of treating dosemeters based on PTFE so as to ensure that the background signal of the dosemeters is reduced. By using the method of the present invention it is possible to reduce the background signal to a level equal to or lower than the background signal from other types of dosemeter based on solid and powdered materials.

The background signals of PTFE dosemeters arise from several sources.

1. Signals induced by exposure to light (as may happen during use and handling). These signals are due to traps similar to the traps used for the thermoluminescent measurement which store charge liberated in the dosemeter by light. Generally blue or ultra violet light are the important components in this process. The traps which cause this effect are generally due to impurities in both the PTFE and the lithium fluoride.

2. Signals due to the reactions of various chemicals (which are impurities in the dosemeter) with oxygen and other impurities either in the dosemeter or on the surface of the dosemeter after handling or use.

3. Signals such as infra red and visible light output simply a product of the heating of the dosemaster. We may include in this the signal due to imperfections in the instrument used for the measurement.

4. Signals due to transfer of energy from deep traps in the lithium fluoride to shallower traps which are then activated by heating during the readout of the dosemeter.

The treatment which we propose is to treat the dosemeter with acid to remove the impurities detailed in (1) and (2) above. The optimum treatment appears to be use of hydrofluoric acid at room temperature for approximately one minute, followed by thorough washing with methanol, and finally drying.

This treatment is best applied after the original manufacture of the dosemeters. It may also be applied to existing dosemeters after they have been in use for some time.

The treatment produces a permanent effect in reducing both the light induced signal and the non-light induced signal. The process may be applied to all types of dosemeter manufactured from PTFE or other plastics or resins which are able to resist brief exposure to acid.

The treatment works particularly well with dosemeters based on PTFE and lithium fluoride. It is also applicable to dosemeters based on calcium sulphate, lithium borate and magnesium borate.

Acids which may be used include hydrofluoric, hydrochloric, nitric, phosphoric and sulphuric.

We believe that part of the background signal is due to decomposition products of the PTFE; produced during the sintering process. These include hexafluoropropylene, perfluoroisobutylene and carbonyl fluoride which may react chemically with the surface layers of the lithium fluoride grains. Lithium hydroxide is one compound which has been implicated in the spurious signals. Lithium carbonate may be another possibility.

The treatment also removes other types of impurity as detailed above.

CLAIMS

1. A method of treating a dosemeter incorporating an active component comprising treating the dosemeter with acid so as to remove impurities in the base and/or the active component whereby the background signal of the dosemeter is reduced.

2. A method according to claim 1 and in which the acid employed is hydrofluoric acid.

3. A method according to claim 1 or claim 2 and in which the treatment takes place at room temperature.

4. A method according to claim 1 and in which the acid is selected from the group comprising: hydrochloric acid, nitric acid, sulphuric acid and phosphoric acid.

5. A method according to any of claims 1 to 4 and in which the dosemeter includes lithium fluoride as the active component.

6. A method according to any of claims 1 to 4 and in which the dosemeter includes an active component selected from the group: calcium sulphate, lithium borate and magnesium borate.

7. A method according to any preceding claim in which the acid treatment is effected by dipping the

dosemeter into the acid.

8. A method according to any preceding claim involving dipping the dosemeter in the acid for one minute, washing with methanol and drying.

9. A method of treating a dosemeter according to any preceding claim and in which the dosemeter is PTFE-based.

10. A method of reducing the background signal of a dosemeter substantially as hereinbefore particularly described.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1982.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.