

Question 1

Claim 1

A honeycomb structure for cleaning exhaust gas from an internal-combustion engine, comprising:

a metal frame (2) including a metal outer wall (20) in the shape of a cylinder and metal plates (21) disposed in a space inside the metal outer wall (20), the space inside the metal outer wall (20) being divided by the metal plates (21) into subspaces (S) each extending in parallel to an axis of the metal outer wall (20); and

a honeycomb unit (3) stored in each of the subspaces (S), wherein the honeycomb unit (3) has cell walls (30) arranged in the form of a polygonal lattice, the cell walls (30) defining cells (31) through which the exhaust gas passes, and the honeycomb unit (3) contains a promoter-containing base material (33) containing (i) a promoter containing a complex oxide at least containing cerium and zirconium and (ii) an inorganic binder for bonding particles of the promoter.

Claim 2

The honeycomb structure according to claim 1, wherein the honeycomb unit (3) contains the complex oxide in an amount of 50 to 98 mass%.

Claim 3

The honeycomb structure according to claim 1 or 2, wherein the metal frame (2) contains a ferritic stainless steel or an austenitic stainless steel.

Question 2

[0004] However, it has become clear that, in a lithium-ion secondary battery that has a positive electrode containing a positive electrode active material that operates at a high potential over 4.24 V when the battery is fully charged (such a battery may be hereinafter referred to as the "high-voltage lithium-ion secondary battery"), a carbonate solvent in an electrolyte for the lithium-ion secondary battery usually undergoes oxidative decomposition at the surface of the positive electrode. This shortens the cycle life of the battery and results in gas generation in various portions of the battery. Therefore, conventional electrolytes cannot be used in a high-voltage lithium-ion secondary battery and thus there is a demand for a new electrolyte that undergoes little oxidative decomposition at the positive electrode.

[0005] Patent Document 2 proposes a method by which to suppress the decomposition of a nonaqueous electrolyte at the positive electrode by adding a specific phosphoric acid ester compound to the nonaqueous electrolyte. Specifically, the oxidation resistance of a nonaqueous electrolyte is improved by adding 5 mass% of tris-(2-propenyl)phosphate to the nonaqueous electrolyte.

Patent Document 3 proposes a method by which to improve high-temperature characteristics of a lithium-ion secondary battery by adding a specific unsaturated phosphoric acid ester compound to a nonaqueous electrolyte. Specifically, Patent Document 3 states that cycle characteristics at high temperature is improved by adding 1 mass% of tris-(2-propynyl)phosphate to the nonaqueous electrolyte.

Question 3

[0010] A scintillator crystal of the present invention contains Mn, which is the heaviest constituent in the crystal. The atomic number of Mn is 25. There is nothing like this scintillator crystal composed of such light elements. Conventional scintillator crystals have a large absorption coefficient. Therefore, for example, an X-ray is absorbed only at the entrance surface and near-surface regions and the atoms in the crystal do not contribute to the detection of the X-ray. On the other hand, the scintillator crystal of the present invention has a small absorption coefficient and thus an X-ray enters deep inside the scintillator crystal. Therefore, many atoms seem to contribute to light emission.

[0011] Mn is added in an amount of 0.1 to 5.0 mol%, preferably 0.5 to 4.0 mol%, with respect to 1 mol of the base material. This amount is to be used just as a guide for preparation of the crystal. Since the state of Mn in the base material is still unknown, the amount of Mn in the resulting crystal may be somewhat different.

Question 4

Thermal shrinkage

Straight lines each 100 mm in length were drawn on a test piece (a film measuring 15 mm × 120 mm) in parallel to the MD and TD, respectively. The test piece was allowed to stand at ambient temperature and pressure (at a temperature of 23°C and a humidity of 50%) for 2 hours, and thereafter the length of each straight line was measured. The measured lengths were used as the lengths before the test. Next, the test piece was left to stand for 30 minutes with its corner fixed in an oven with internal air circulation set at 150°C, 180°C, or 200°C, and thereafter taken out and allowed to cool at ambient temperature and pressure for 2 hours. Then, the length of

each straight line was measured, and the difference between the lengths before and after the test was determined, whereby the thermal shrinkage R_2 , which is the percentage of the difference between the lengths before and after the test, was calculated. When R_2 is a positive value, this means that the test piece has shrunk.

Excellent: absolute value of $R_2 \leq 1.5\%$ (excellent)

Good: $1.5\% < \text{absolute value of } R_2 \leq 2.0\%$ (good)

Average: $2.0\% < \text{absolute value of } R_2 \leq 2.5\%$ (no problem in practical use)

Poor: $2.5\% < \text{absolute value of } R_2$ (may have some problem in practical use)