Preparation and Antibacterial Properties of Negative Ion Coatings

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Abstract: The negative ion compound powder body showed greater dispersion stability by the sol-gel method to deposit silica onto its surface. With the different addition, negative ion functional coatings developed can produce the biggest density. It was studied in the paper that the antibiotic result and negative ion concentration, anion material diameter of particle, distance of the functional coatings are closely related. It was found that the higher negative ion, the less bacterial. Material with high ion concentration can efficiently kill bacterial. The antibacterial effect of the anion has verified that functional coatings have disinfected the microcosmic.

Key words: tourmaline; negative ion; functional coatings; antibacterial
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This text is on the basis of utilizing tourmalines to prepare anion additive[1], succeed in preparing out the complex coating with good dispersiveness and releasing anions with high stability under the normal temperature condition, improve the practical value of the function coating greatly. Add the anion additive and nanometer oxidize the titanium to the coating[2], study release performance of negative ion in water based paint systemic research between air anion and density of anion material, discuss the antibiotic performance of the anion coating.

1 Experiments

1.1 Experimental materials and instrument

The tourmaline monocrystal, offered by Jiangxi Anyuan Co., Ltd., is dark green and $d_{50}=0.043$ mm.

Reagent: Nanometer oxidizes the titanium; Dispersant: Acumer9400; Gather the acrylic acid ammonium (5027).

Instrument: Air ion counter: SI— the experiment type disperses the emulsification machine; Microorganism's sampling device of ETW-2 air; 2 L Medium mixed and rubbed machine.

1.2 Preparation of the anion powder

Join a certain amount dispersant, wetting-out agent and disappear to steep the pharmaceutical in the distilled water, mix and make and join tourmalines and nanometer TiO_2 powder body. The Na_2SiO_3 solution accedes to disperses the liquid to cover the bag of a certain amount, after dripping while adding H_2SO_4 solution slow and aging, wash with $(NH_4)_2CO_3$ solution, centrifugation, precipitating. Put dry 3 h, grind, make anion compound powder[3] at 110℃.

1.3 Experimental methods

Fetch experiment sample 300 mg, put the big test tube of sterilization, disinfect for 30 minutes under the purple light[4]. Fetch 1×10^6/mL golden yellow staphylococcus fungus liquid 3 mL, put the big test tube put ted the powder material, suck 0.85% of the steriliza tion physiological saline of 27 mL, put the incubator on 36±1℃, shaking one minute every 30 minute, take out 5 hours later, dilute, fetch 0.1 mL fungus liquid to inoculate 3 flatwares of nutrition agar-agar trains (36±1)℃ for 24 hours[5], calculate the colony count, the experiment repeats three times and fetches the average.

2 Results and discussing

2.1 Content of additive in the coating, testing distance on density of anion

From the experimental result, there are certain relations between the density of anion and quality of the powder body: when quantity of the powder increases, the density of anion gradually rises. But when the powder body rises to 500 g, the density of anion increases is not evident. The best proportion is to add 300 g anion powder to 100 L emulsion paint.

2.2 Antibiotic impact of anion additive of different grain sizes

The average grainsizes are 0.5 mm, 0.7 mm,

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1.0 mm, 1.5 mm, respectively NMT experiment consumption is 300 mg/100 L. See Fig. 1 in antibiotic efficiency to the colon bacillus and golden yellow staphylococcus of tourmaline of different grain sizes.

We can see from Fig. 1, the tourmaline powder material that the grain size is below 1.0 mm has better antibiotic function, antibiotic function is faint when the grain size reaches above 2.0 mm.

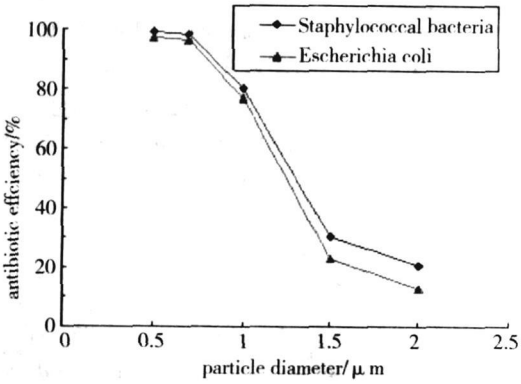

Fig. 1 antibiotic result of 300 mg/100 L

2.3 Antibiotic performance of anion coating

The experimental result is the average number value of the experiment three times, killing the restraining rate equally and is more than 97% to the colon bacillus and golden yellow staphylococcus of anion coating.

The antibiotic of anion coating additive has very strong restraining the bacteria, see Fig. 2, including colon bacillus, golden yellow staphylococcus, etc, antibiotic rate above 97%.

3 Conclusions

(1) The anion coating can avoid reunion of the material through adopting Na_2SiO_3, improve the production amount of the anion through adding the nanometer TiO_2 powder body.

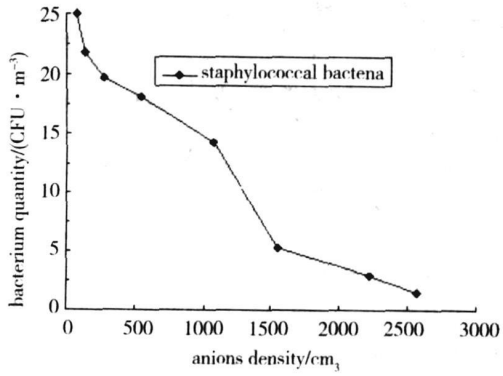

Fig. 2 relation density of anion and bacterium

(2) The anion powder can produce steadily anion, its happenning amount of anion relate to powder mass, test distance, environmental temperature.

(3) The anion coating has stronger sterilization capability. Its antibacterial rate reach above 97%, antibiotic result get a long time.

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环境功能负离子涂料的制备及抗菌性能研究

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摘 要: 采用溶胶—凝胶法以 Na_2SiO_3 为包覆剂成功地制备了分散性优良负离子粉体, 通过不同的添加量, 研制能够产生最大负离子浓度的功能涂料。进行了负离子涂料的抗菌性研究, 实验结果表明负离子材料具有抗菌性, 抗菌效果与涂料的负离子产生量、负离子材料粒径、涂料的距离密切相关, 并从微观上对负离子杀菌进行了分析, 验证了负离子的生物学效应。

关键词: 电气石; 负离子; 功能涂料; 抗菌

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