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Interaction of Chain Reaction in the Air with Pigmented Surfaces

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ABSTRACT

Illumination of pigmented surface results in formation of singlet oxygen molecules. Light absorbtion by dimole singlet oxygen complexes leeds to formation of exiplexes N_2-O_2 ($A\ ^3\Sigma$, E=4.3 eV), which are able to radiate two visible photons. This makes a mechanism for photons multiplication in the air near the pigmented surface (for example: white paper, white foam rubber, matrix of digital photo camera). The light energy produced in this process can be many times bigger then the energy used by laser pointer for the initiation of described above process.

Keywords: Molecular Singlet Oxygen; Dimole Complex of Singlet Oxygen; Exiplex N_2-O_2($A\ ^3\Sigma$, E=4.3 eV); Chain Reaction In Air; Photons Multiplication; Light Energy Production

Introduction

Let's consider two statements based on published data:

1) Irradiation of pigmented surfaces produces molecular singlet oxygen [1,2];

2) Presence of singlet oxygen is needed for photon multiplication in atmospheric air [3].

One can expect avalanche like growth of singlet oxygen concentration and luminescence intensity from the irradiated pigmented surface contacting with atmospheric air. When we use a digital photo camera for making a photo of light spot on the white paper we shall deal with a second light spot – on the matrix of photo camera. Avalanche like growth of luminescence intensity near the matrix surface will produce some changes on the image obtained. Let's consider for example the image of light spot produced by green beam of laser pointer on the white paper (Figure 1). It should be noted, that UV irradiation (N2 laser with wave length 337 nm) of white paper produces blue fluorescence, demonstrating the presence of some pigment on the paper surface.

Looking by eye on the light spot from green laser beam, one cannot detect white or blue radiation: the green light only. One can conclude, that white and blue parts on the Figure 1 are produced on the photo camera matrix only (not on the paper) in the zone of maximal light intensity. This is the result of photons multiplication near illuminated matrix surface. The diameter of green light spot from laser beam is less than 15 mm (when looking by eye), but on the Figure 1 it is bigger than 100 mm. Even more bright demonstration of photons multiplication near the pigmented surface can be obtained by illuminating the foam rubber. The experimental installation outlined on the Figure 2 contains two peace of foam rubber. One can see two sharply outlined bright light spots of white color (Figure 3). Obviously only one of them is located in the point of laser beam interaction with the foam rubber. Radiation produced at this point initiates the luminescence from the second light spot. At the end bright light spots are characterized by surface area, which is by the order of magnitude bigger than the primary light spot. So, the light flow from the foam rubber surface is expected to be much bigger than the light flow from the laser pointer itself. That result can make a basis for designing in future effective "green" electric power stations.

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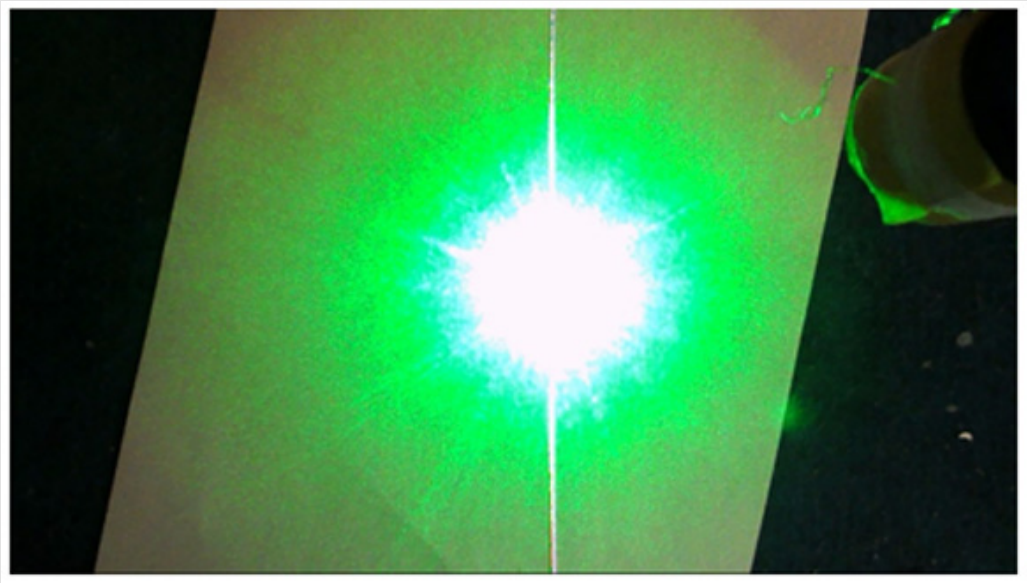
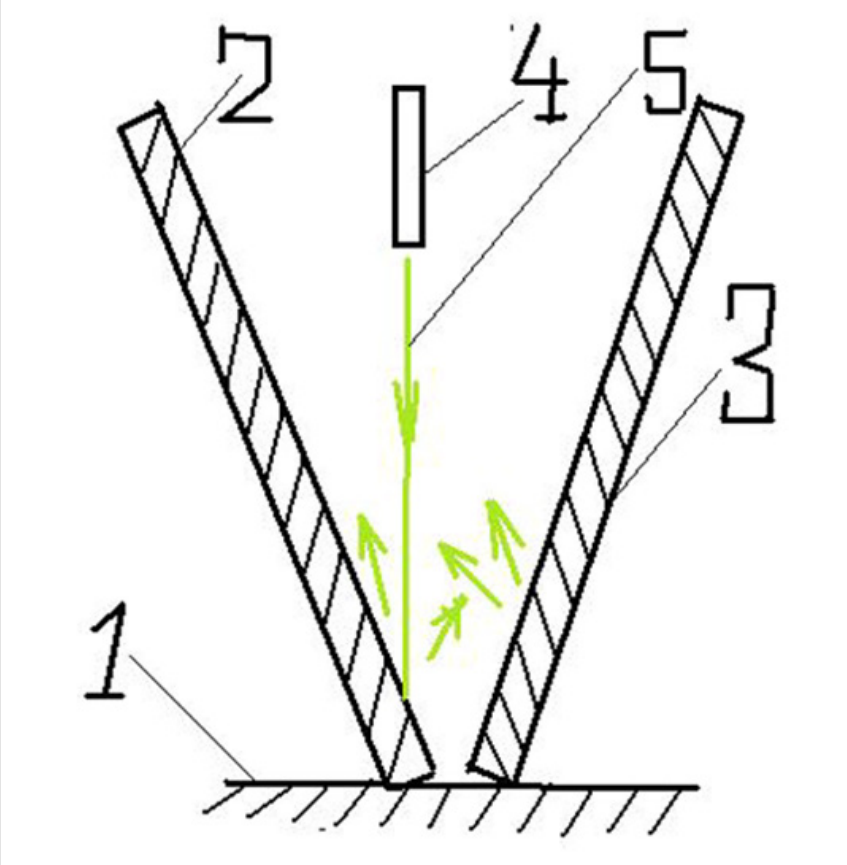


Figure 1: The Image of light spot-on white paper produced by green laser pointer beam.



Note: Designations: 1) mirror; 2,3) – foam rubber peace's of 50 mm thickness; 4) laser pointer; 5) green laser beam.
Figure 2: Outline of experimental installation with two pieces of foam rubber and laser pointer.

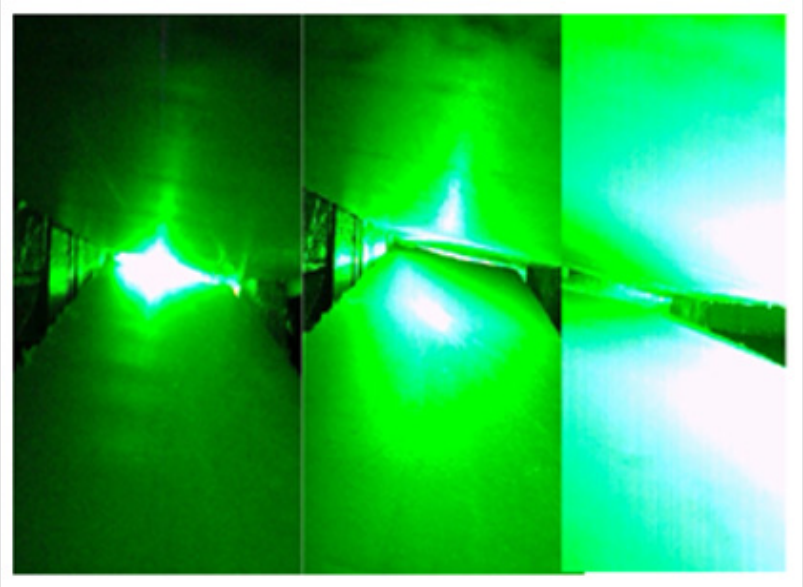


Figure 3: Three photo of air inflammation zones on the foam rubber surface, initiated by laser pointer in cases of different directions of laser beam.

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