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PREPARED SiO_2 DOPED WITH FLAXSEED OIL AND OLIVE OIL BY SOL-GEL AS SEMI WHITE GENERATION MATERIAL

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ABSTRACT
Silica matrix doped with Flaxseed oil and Olive oil is prepared via Sol-Gel. The photos luminous PL for prepared samples are obtained with excitation wavelength equal to 390nm. The photo luminous spectrum for Olive oil: SiO_2 showed two peaks around 530nm and 670nm which correspond to Vitamin E and chlorophylls respectively, while the photo luminous spectrum for Flaxseed oil: SiO_2 showed wide peaks around 475nm and covered the most of two region (blue and green) of the three primary colors regions. The PL spectrum for SiO_2 doped with Olive oil and Flaxseed oil has a wide bandwidth which covers most of three primary colors regions (red, green and blue). According to result of this work, it could be noted to use SiO_2 doped with Olive oil and Flaxseed as optical material to generate of semi white light.

KEYWORDS: Sol-Gel; SiO_2; Olive oil; Flaxseed oil; white light generation.

INTRODUCTION

The Olive oil is a fat oils and could be produced by pressing of olives fruits. The photos luminous PL for olive oils showed several peaks at wavelength 445 nm, 475 nm 525nm and 681 nm (last peak is much high than other peaks), first two peaks correspond to conjugated hydro peroxides while the other peaks correspond to vitamin E and chlorophylls[1]. Usually the refined oils have only one strong peak around wavelength 445 nm which attributed to fatty acid oxidation (due to the large percentage of polyunsaturated fatty acids). Flaxseed oil, also known as Linseed oil, is a colorless to yellowish oil obtained from the dried, ripened seeds of the flaxplant (*Linum usitatissimum*). The oil is obtained by pressing, sometimes followed by solvent extraction. Due to its polymer-forming properties, the linseed oil can be used on its own or blended with combinations of other oils. Linseed oil use has declined over the past several decades with increased availability of synthetic alkyd resins, which function similarly but resist yellowing[1-6].

Many papers have been published to study the fluorescence of vegetable oils[7-10]. The present work investigate of the capability of Sol-gel technique[10, 13] to prepare of SiO_2 doped with flaxseed oil and Olive oil, then discover the capability of prepared sample to be optical material for generation of semi white light.

Samples Preparation

The tetraethyl ortho silicate 98% T E O S from Aldrich, flaxseed oil, Olive oil, hydrochloricacid HCl 34.5% and Ethanol E tOH 99.9% used to prepare doped samples. Deionized water used to hydrolysis of T E O S in order to prepare pure and doped SiO_2 sol. The amount of molar ratio of each chemical; TEOS: H_2O: Et O H: HCl=1:1:10:0.1. Firstly, TEOS mixed and stirred with Et O H for about ten min. Water mixed with 0.1 M catalysts, then by drop wise are adding to the above solution. The molar ratio (ratio of water to T E O S) is equal to about two. Flaxseed oil and Olive oil are used to prepare of doped samples, 0.05 ml from each oil is added to E t O H before mixing it with T E O S. All solutions left for aged process for 24 hours, and then first drying occurred at temperature 55^{o}C. Finally, drying process achieved, during the drying process the solvent is evaporation from samples.

Excitation spectrums and Emission spectra measured by using Shimadzu Spectro Flurometer RF1501 at room temperature by (light source at wavelength 390m used as excitation light).

RESULT AND DISCUSSION

The photos luminous PL in range of 350–750nm (excitation wavelength equal to390m) for Flaxseed oil: SiO2, Olive oil: SiO_2, Flaxseed oil @Olive oil: SiO_2 are present in figure 1,2 and 3 respectfully. The PL spectrum for pure flaxseed oil have a peak at wavelength around to 460nm with wide bandwidth (420nm →540nm) which covered the most of first two region (blue and green) of the three primary colors regions, this peaks is attributed to conjugated hydro peroxides and its maximum value to is located at the wavelength around 468.

The PL spectrum Olive oil: SiO_2 sample show two fluorescence peaks, first one in range of 600-695nm appear at wavelength 671nm which attributed to chlorophylls[3,6,7]. The seconds peaks in range of 450-600nm appear at wavelength 585nm which attributed to Vitamin E [3,6,7].

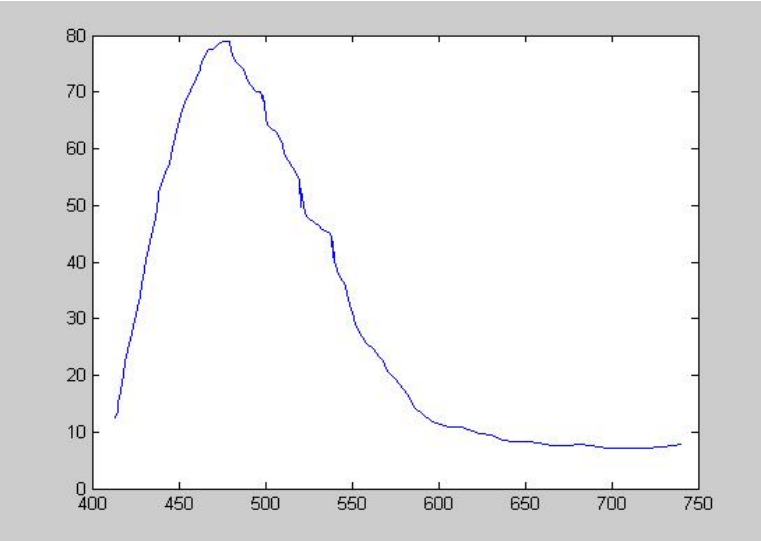

FIGURE 1: Photo luminescencespectrum for SiO^2 doped with Flaxseed oil

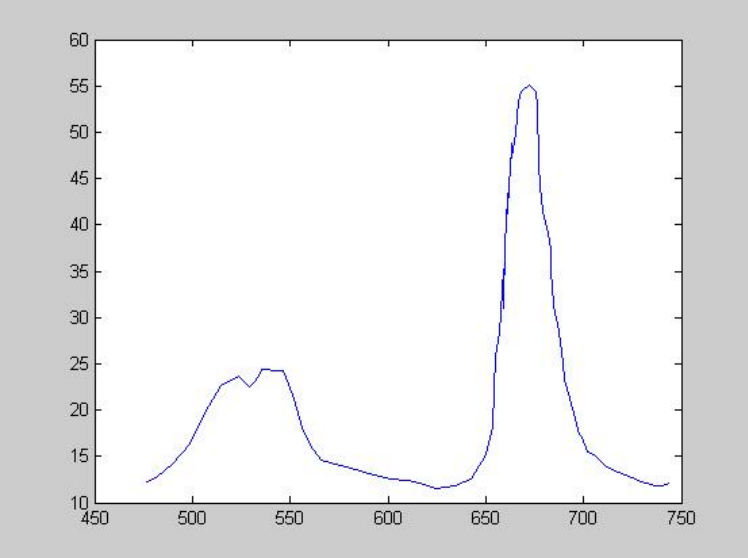

FIGURE 2: Photoluminescence spectrum for SiO_2 doped with Olive oil.

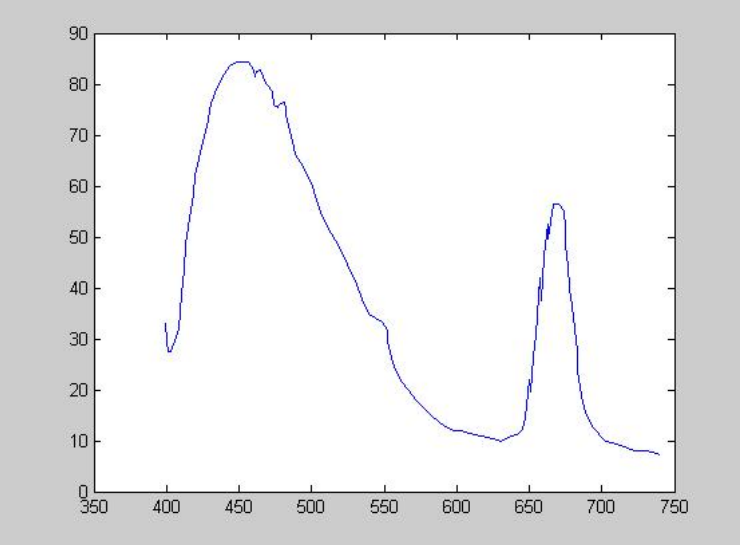

FIGURE 3: Photoluminescence spectrum for SiO_2 doped with Flaxseed oil and Olive oil

As shown in figure (3), all peaks which recorded in PL spectra to Olive oil: SiO_2 or Flaxseed oil: SiO_2 are appeared in the PL spectrum of SiO_2 sample doped with both of Flaxseed oil and Olive oil. The PL spectrum show three peaks at the wavelength 445nm, 540nm and 670nm, these peaks are attributed to the conjugated hydro peroxides, Vitamin E and chlorophylls respectfully. At the same time, it could clearly noted that PL spectrum of doped sample with both oil cover most of three primary colors regions (red, green and blue).

That's explaining why the fluorescence of doped sample seems to be as semi white light when exciting it with 405nm Laser diode, figure (8).

The color of any light could be determined with help of CIE 1931chromaticity diagram, the perception of the color by this way is related to the Commission International d'Eclairage (CIE) which is presented in 1931 by [101,102]. The x and y values of chromaticity coordinates are calculated by following equation:

$$x = X/(X+Y+Z) \quad \ldots\ldots\ldots (1)$$

$$y = Y/(X+Y+Z) \quad \ldots\ldots\ldots (2)$$

where X, Y and Z are the integral values weighted, The X, Y and Z are found from photoluminescence spectrum by finding the area under the curve of the three region of the power distribution spectrum (red, green and blue colors). The values of chromaticity coordinates (x,y) for the three doped samples are listed in Table (1), figure (4) is illustrated the chromaticity coordinates (x,y) in CIE 1931chromaticity diagram.

TABLE 1: Chromaticity Coordinates value (x,y) for the three doped samples

Sample	x value	y value
Olive : SiO_2	0.428	0.456
Flaxseed : SiO_2	0.266	0.312
Olive @ Flaxseed : SiO_2	0.261	0.259

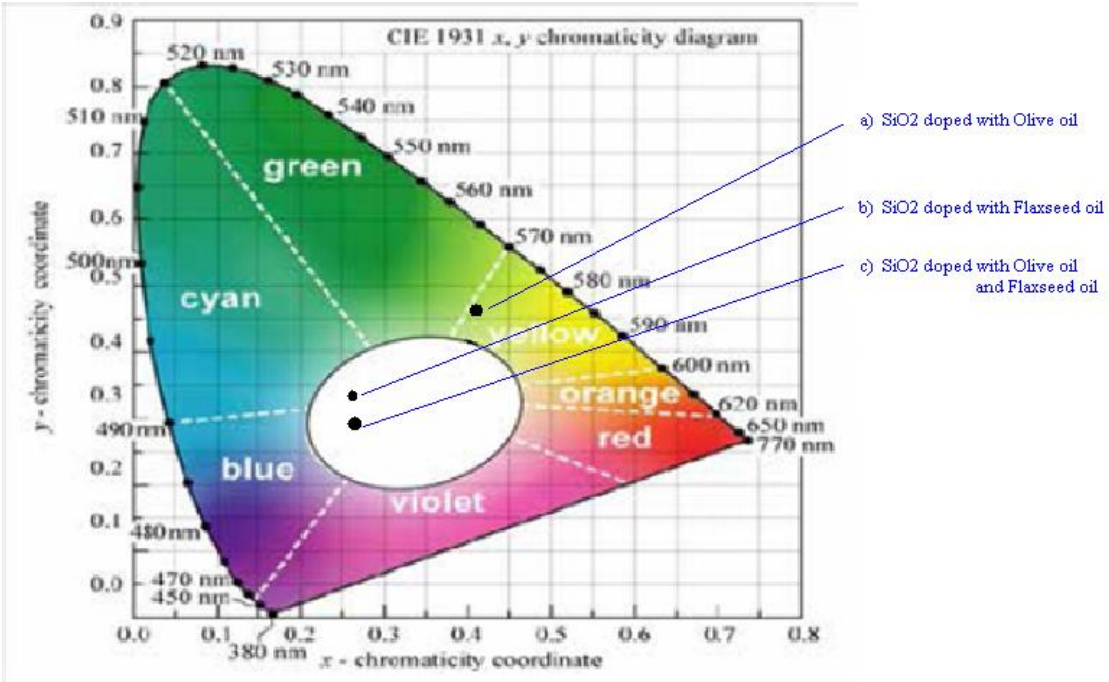

FIGURE 4: The CIE Chromaticity Diagram with the chromaticity coordinates of (x,y) for a) SiO_2 doped with Olive oil , b) SiO2 doped with Flaxseed oil and d) SiO_2 doped with Olive oil and Flaxseed oil.

The parameter called correlated color temperature CCT is much important parameter in videographer, photography, lighting and any other fields. The CCT could be found from McCamy's approximation algorithm and with help of following equation

$$CCT = -449n^3 + 3525n^2 - 6823.3n + 5520.33 \ldots. (3)$$

Where

$$n = \frac{x - 0.3320}{y - 0.1858}$$

The degree of Kelvin is used to define of CCT value, its value usually around 2700K for warm white light, 4000K for neutral white light and more than 5000K for cool white. It was found that CCT value for SiO2 sample doped with Olive oil and flaxseed oil is around 2685K, which classified in white warm region

CONCLUSION

The Silicon dioxide doped with Olive oil and Flaxseed oil is successfully prepared by wet chemical synthesis method. The photoluminescence PL spectrum of doped sample is covering most of three primary colors regions (red, green and blue), the CCT value for doped sample is around 2685K, which classified in white warm region. The

PL of doped sample seems to be as semi white light when exciting it with UV light source. According to the result of this work, it could noted to use sol gel method to prepare of optical active material for semi white generation by doping SiO2 with Olive oil and Flaxseed oil.

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