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XRD and Laser Damage Porch Data (for 10000 Nm) of Diethyl 3, 3′-[(2, 4-Dichlorophenyl) Methylidene] Bis (1h-Indole-2 Carboxylate) Crystals

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Abstract: *Crystalline materials have some important specifications of applications comparatively with non crystalline materials. Here Diethyl 3,3′-[(2,4-Dichlorophenyl) Methylidene] Bis (1h-Indole-2-Carboxylate) Crystals are of main applications such as Opto electronic and frequency response…The XRD data reveals that Diethyl 3,3′- [(2,4-Dichlorophenyl) Methylidene] Bis (1h-Indole-2-Carboxylate) Crystals have Chemical formula as $C_{29}H_{24}Cl_2N_2O_4$ and Crystal system is Monoclinic, Space group is $P2_1/c$ and Temperature (K) is 298 and parameters are a, b, c (Å) as 9.777, 15.939, 17.582 and β is 101.94. If it is used as 10000 nm % of LDT rating is **85.68%** and possibility of damage is probable.*

1. Introduction

A crystalline material is a solid material in which the component atoms are arranged in a definite pattern and whose surface regularity reflects its internal symmetry. The definition of a solid appears obvious, a solid is generally thought of as being hard and firm.

1.1. Long-Pulse / Cw/ Quasi-cw Lasers

LDT is generally specified in terms of pulse fluence for "long-pulse lasers." Long-pulse lasers have pulse durations τ in the nanosecond (ns) to microsecond (μs) range, with repetition rates *R* typically ranging from about 1 to 100 Hz. As an example, suppose a frequency-doubled Nd:YAG laser at 532 nm emits 10 ns pulses at a 10 Hz repetition rate with 1 W of average power. This laser has a duty cycle of 1×10^{-7}, a pulse energy of 100 mJ, and a peak power of 10 MW. Damage from cw lasers tends to result from thermal (heating) effects. For this reason the LDT_{CW} for cw lasers is more dependent on the material and geometric properties of the sample, and therefore, unlike for long-pulse lasers, it is more difficult to specify with a single quantity. Quasi-cw lasers are pulsed lasers with pulse durations τ in the femtosecond (fs) to picosecond (ps) range, and with repetition rates *R* typically ranging from about 10 – 100 MHz for high-power lasers.

2. Results and Discussions

The crystal diethyl 3,3′-[(2,4-dichlorophenyl)methylidene]bis(1*H*-indole-2-carboxylate) is prepared by slow evaporation method and Ethyl indole-2-carboxylate (1.88 g, 10 mmol) was dissolved in 20 ml ethanol; commercially available 2,4-dichlorobenzaldehyde (0.88 g, 5 mmol) was added and the mixture was heated to reflux temperature. Concentrated HCl (0.5 ml) was added and the reaction was left for 1 h. After cooling, the white product was filtered off and washed thoroughly with ethanol. The reaction was monitored; Colorless block-like crystals of the designation compound suitable for X-ray analysis were obtained in 92% yield by slow evaporation of an ethanol solution. In the title compound, $C_{29}H_{24}Cl_2N_2O_4$, the mean planes of the two indole ring systems (r.m.s. deviations = 0.1249 and 0.0075 Å) are approximately perpendicular to one another, with a dihedral angle of 80.9 (5)° between them. The benzene ring is inclined to the mean planes of the two indole ring systems by 76.1 (3) and 78.3 (4)°. Weak intramolecular C—H···π interactions affect the molecular conformation. In the crystal, pairs of N—H···O hydrogen bonds link the molecules into inversion dimers which are further linked into supramolecular chains by N—H···O hydrogen bonds and short Cl—Cl contacts. Fig.3.1 represents the atomic arrangement of diethyl 3,3′-[(2,4-dichlorophenyl)methylidene]bis(1*H*-indole-2-carboxylate).

2.1. Crystal Data

Chemical formula	$C_{29}H_{24}Cl_2N_2O_4$
Crystal system	Monoclinic
Space group	$P2_1/c$
Temperature (K)	298
a, *b*, *c* (Å)	9.777, 15.939, 17.582
β	101.94°
Crystal size (mm³)	0.30 × 0.20 × 0.10

The XRD data reveals that diethyl 3,3′-[(2,4-dichlorophenyl) methylidene] bis (1*H*-indole-2-carboxyl-ate) is *monoclinic* in type and $P2_1/c$ group and from LDT it specifies that for *10000nm LASER damage is probable.*

3. Conclusion

Diethyl 3,3′-[(2,4-dichlorophenyl) methylidene] Bis(1*h*-indole-2-carboxylate) crystals are grown by slow evaporation method and here the grown material is subjected to XRD and LDT and from that it is monoclinic in nature can be analysed and for pulsed lasers in the range of µsec to nsec, the energy density varies as a function of the square root of the time domain. As a rule of thumb, an optic can withstand 10 times more energy when used with a 1 µsec pulsed laser than a 10 nsec pulsed laser. Chemical formula is $C_{29}H_{24}Cl_2N_2O_4$ and Crystal system is Monoclinic and Space group is $P2_1/c$ *and* Temperature (K) as 298 and parameters are *a*, *b*, *c* (Å) as 9.777, 15.939, 7.582 β is 101.94°and Crystal size (mm³) 0.30 × 0.20 × 0.10. Laser MuX with Long pulse type with wavelength of 1000 nm and Energy 50J duration of 25ns and Rate of Repetition of 50MHz and diameter of beam 50mm will produce. The single and multiple shots (10 pulses) laser damage threshold values were found to be 3.68 and 3.5 GW/cm² respectively. If it is used as 10000 nm, % of LDT rating is **85.68%** and possibility of damage.

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