Title: Study on the Series resistance of Organic Dye based Devices

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Abstract

The major objective of this work is to study and estimate the series resistance (R_s) of different organic dye based devices considering the effect of traps. To carry out this work it has been planned to fabricate devices of organic dyes and study the current-voltage (I-V) characteristics to analyse the series resistance and various electrical parameters on the basis of suitable theory. It is well known that the dark I-V characteristic of any diode shows linearity in the semi logarithm scale at low voltage. But with the increment of bias voltage the characteristic deviates from the linearity. This deviation mainly occurs due to the presence of series resistance. There are different techniques to measure this series resistance. It is described in many literatures that the value of this series resistance of any organic device is very high. There is not much explanation on the high value of the series resistance. And also the effect of traps in the metal organic semiconductor interface is not well understood. So to study the physics behind series resistance is very important to lead to better performance of organic device.

In this context we have prepared several organic devices using Thionin (TH), Phenosafranin (PSF), Crystal Violet (CV), Methyl Red (MR) and Malachite Green (MG) dyes and study the series resistance of these devices. The current voltage characteristics of the devices have been analyzed by using different techniques to measure the R_s. The correlation between trap energy and R_s has also been studied. Different NPs such as TiO_2, ZnO and CNT have been incorporated to study their effects on R_s. The effect of temperature on R_s is also been investigated in this work.

For those who are working in this field, we believe the findings of the current study may be helpful. The measurement's accuracy has been examined several times for a variety of systems.

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Signature of the Supervisor

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