Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Soft template mediated synthesis of Bi-In-Zn-S and its efficient visible-light-driven decomposition of methylene blue

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General Experimental procedure:

All reagents were purchased either from Sigma or Alpha Aesar. Solvents were dried and purified using standard techniques. IR spectra were recorded in KBr on a Shimadzu IR Afinity I. SEM images were obtained from a Hitachi S-4800 microscope at an operating voltage of 15Kv. The sample was coated with platinum for effectual imaging before being charged. TEM images were obtained from JEOL instrument using Cu grid. UV-vis and fluorescence data was recorded in UV-vis spectrophotometers of Shimadzo UV-2550 using standard 1 cm quartz cuvette and Fluoromax-4 spectrofluorometer of Horiba Jobin YVON respectively. X-ray powder diffraction study was carried out on a Rigaku X-Ray diffractometer at a voltage of 35 Kv using Cu Kα radiations (λ=0.15418 nm) at scanning rate of 0.20°/minute in the 2θ range 10-80°. BET measurement was performed using Smart Instruments; model no- Smart Sorb 92/93 and finally TGA experiment was carried out in SDT Q600.

Calculation of global effective energy (Sunlight) using pyranometer:

Model No-CMP 11

Sensitivity: 9.62μv/W/m^2

Solar global Energy: [(1000*5.70)/9.62]=**592.51W/m^2**

Preparations of catalyst: Bi-In-Zn-S (BIZS)

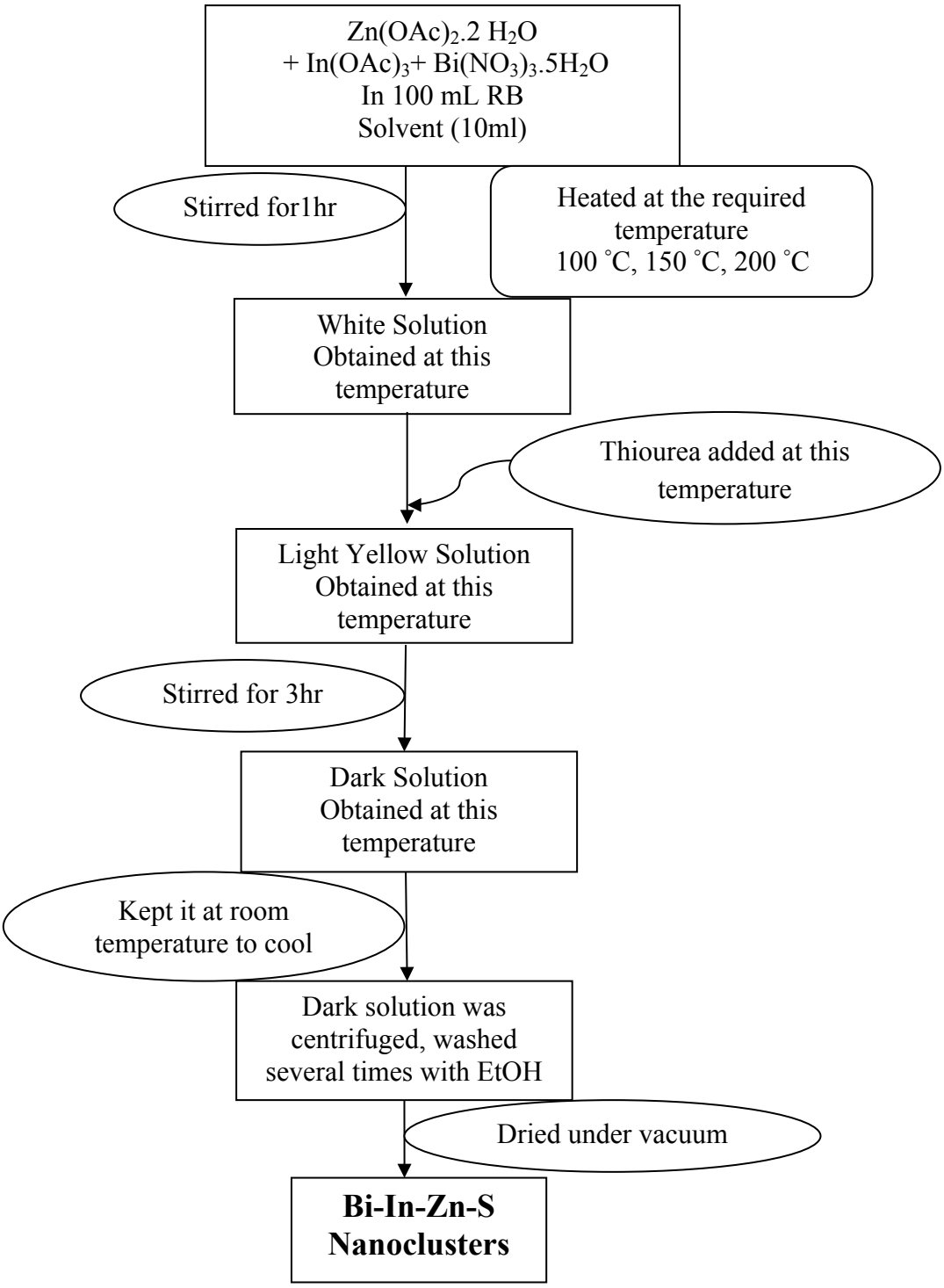

Fig. S1 Preparations of catalyst: Bi-In-Zn-S (BIZS) –Flow chart Diagram

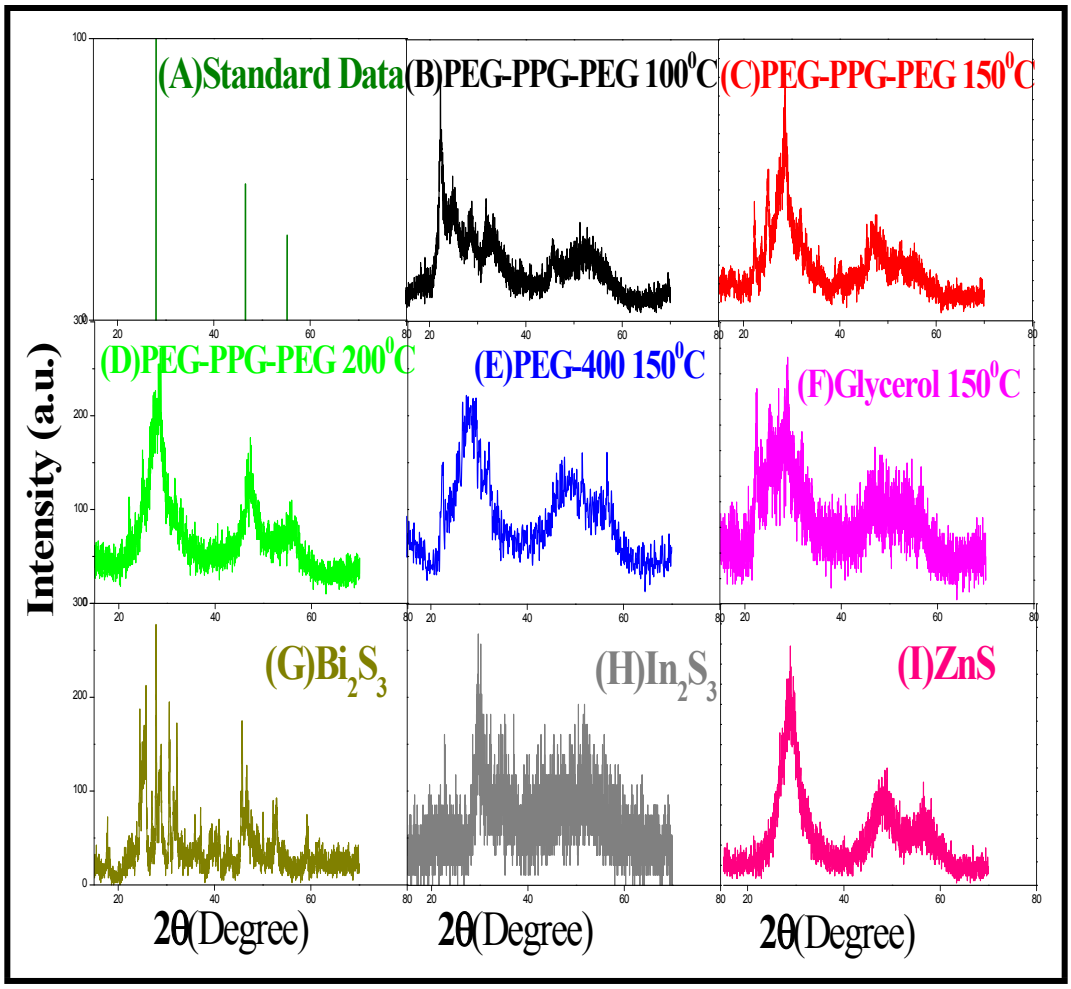

Fig S2 PXRD of BIZS prepared at various temperature and solvent and corresponding Metal Sulfide.

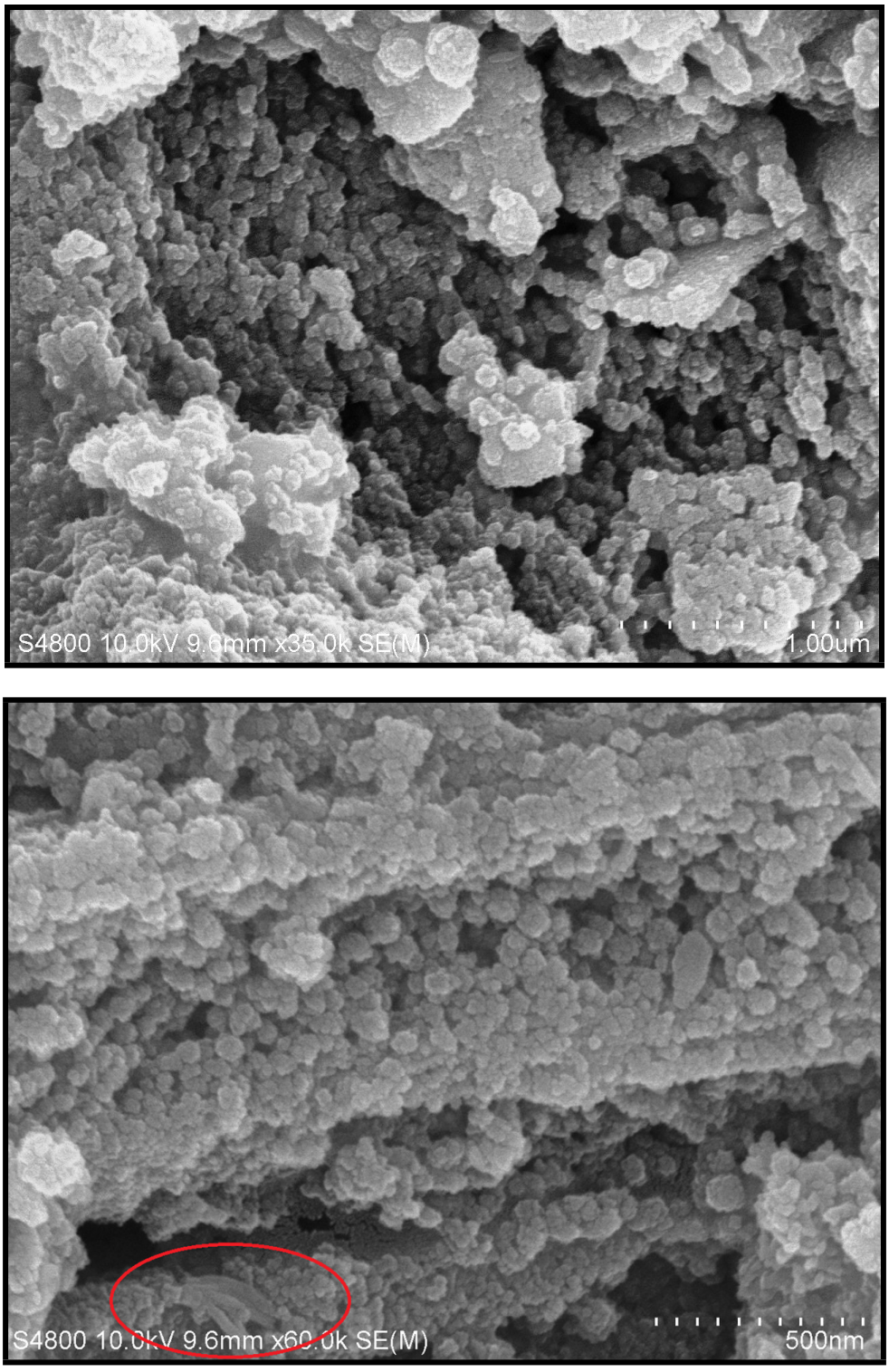

Fig. S3 Morphological study of BIZS prepared at 100 ˚C using PEG-PPG-PEG as solvent. A). Low magnification FE-SEM image of BIZS, B) FE-SEM image of BIZS at 500nm.

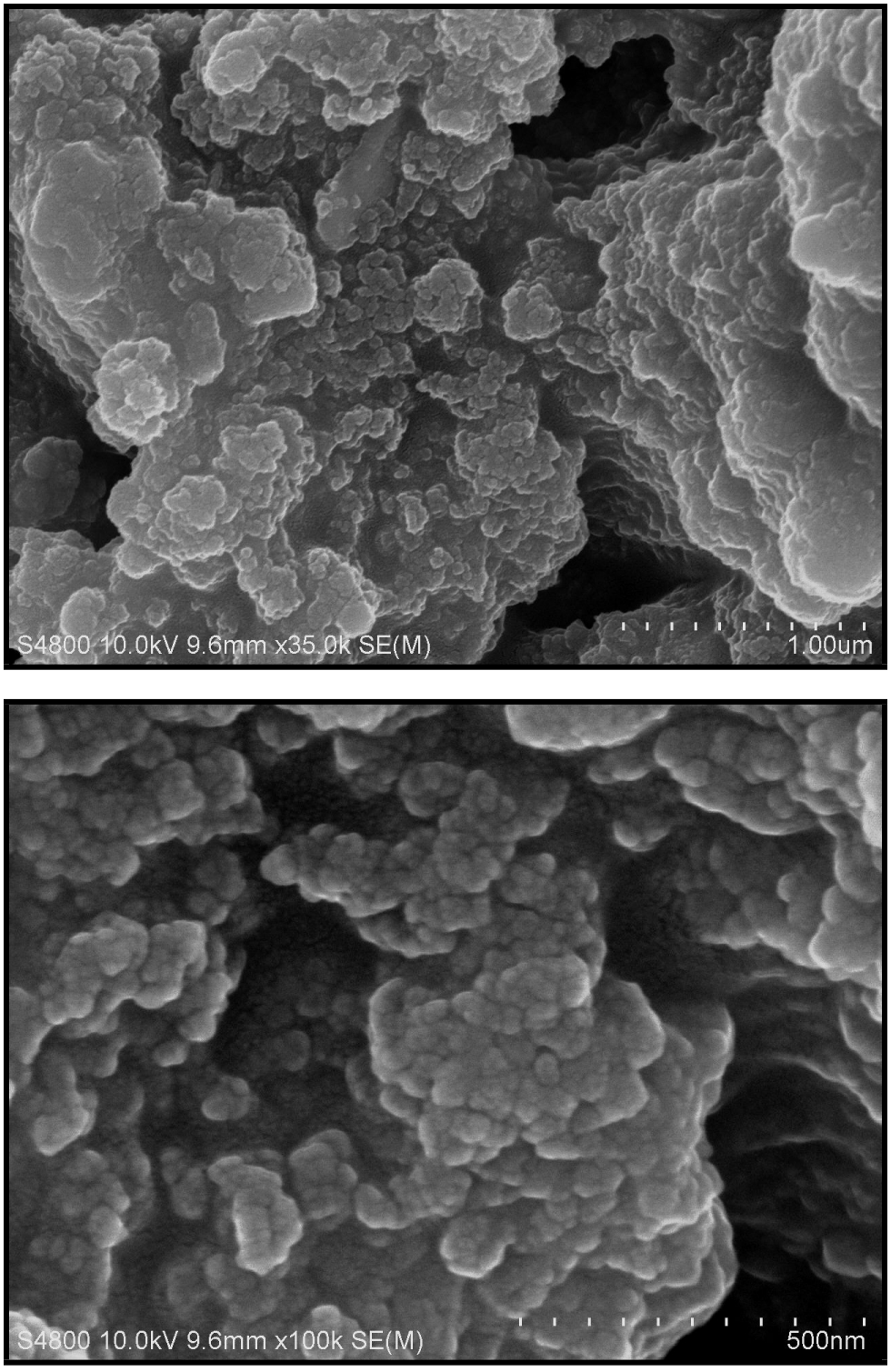

Fig. S4 Morphological study of BIZS prepared at 150 ˚C using PEG-PPG-PEG as solvent. A). Low magnification FE-SEM image of BIZS, B) FE-SEM image of BIZS at 500nm.

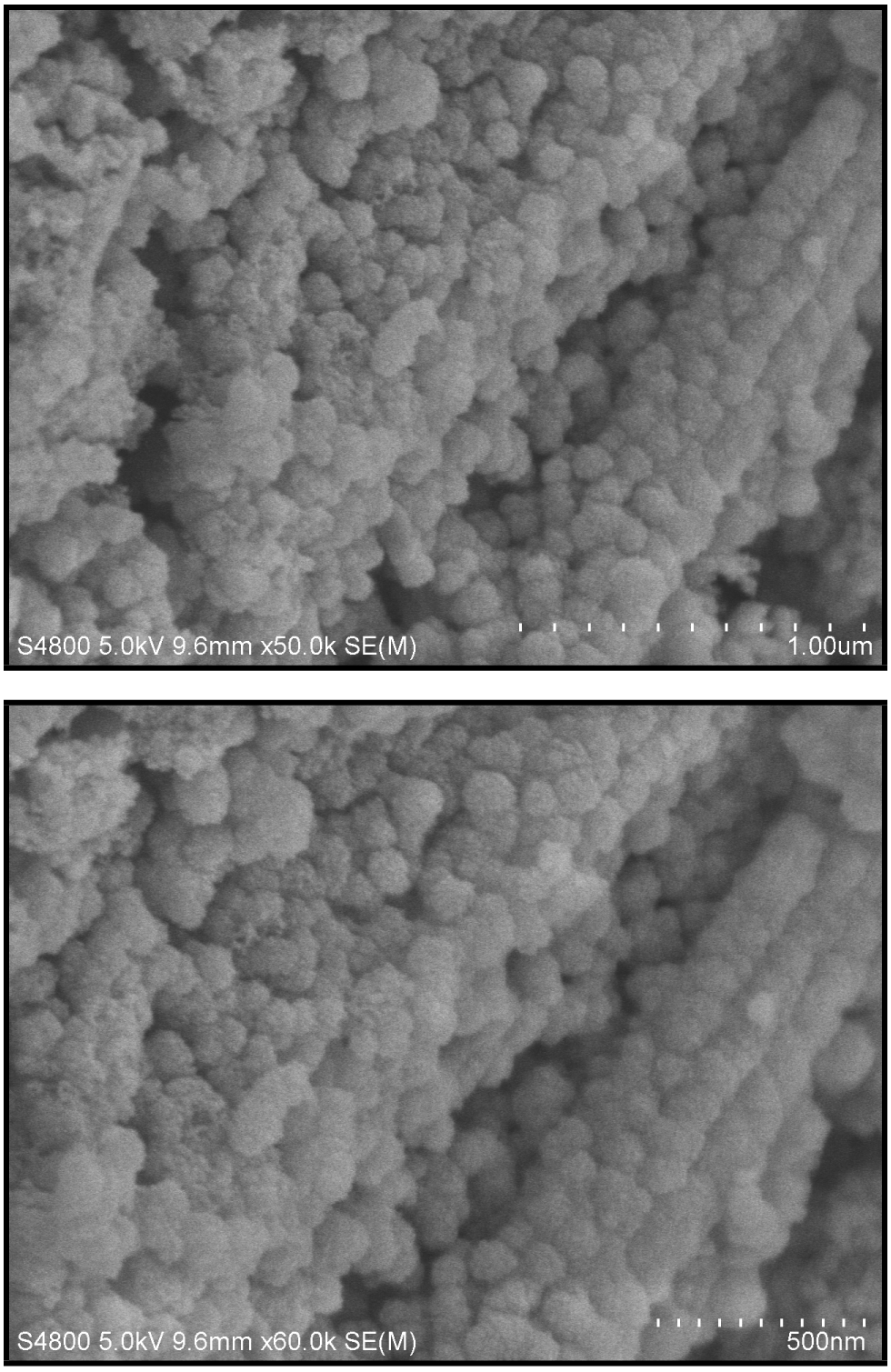

Fig. S5 Morphological study of BIZS prepared at 150 ˚C using PEG-400 as solvent. A). Low magnification FE-SEM image of BIZS, B) FE-SEM image of BIZS at 500nm.

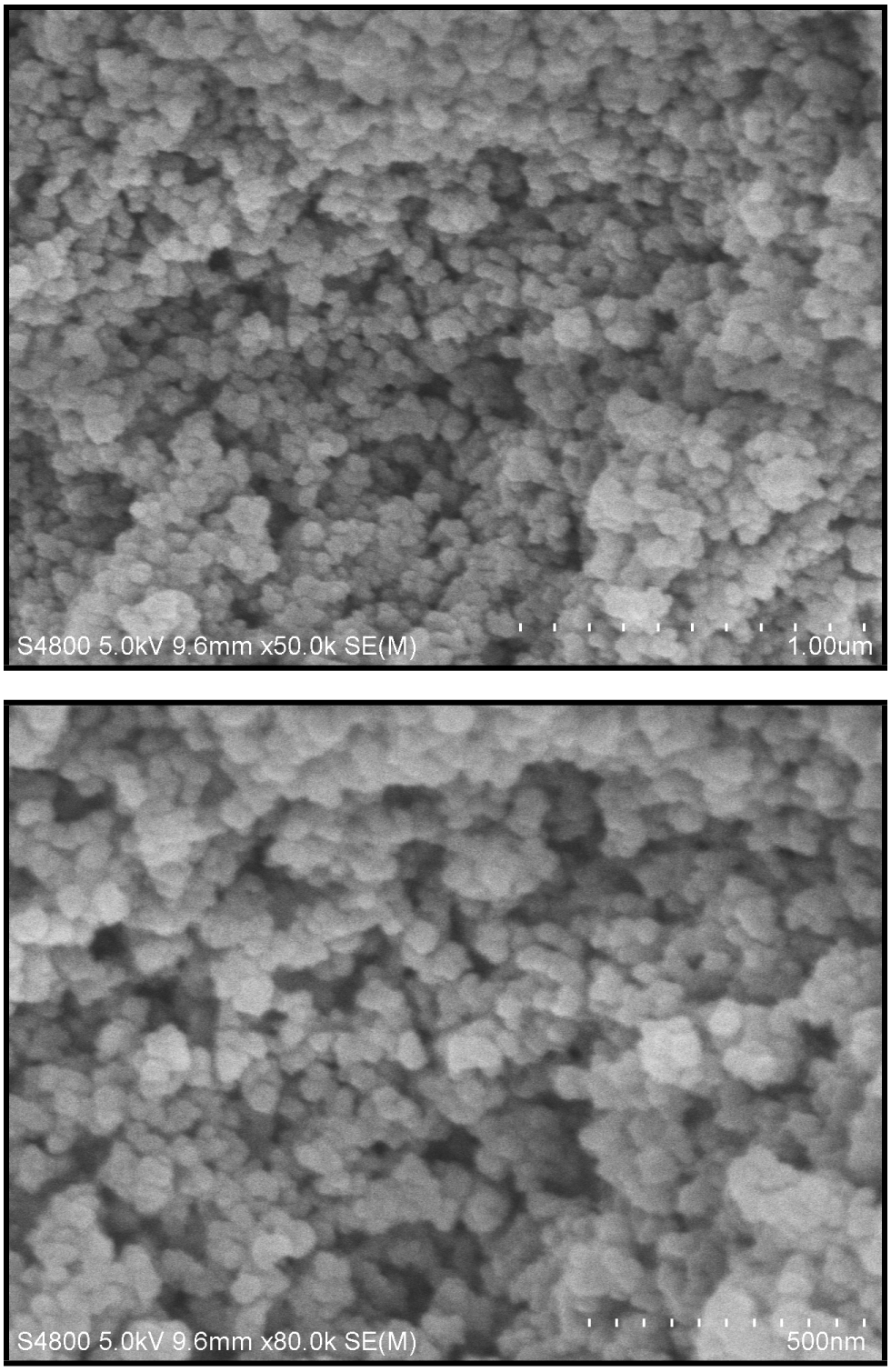

Fig. S6 Morphological study of BIZS prepared at 150 ˚C using Glycerol as solvent. A). Low magnification FE-SEM image of BIZS, B) FE-SEM image of BIZS at 500nm.

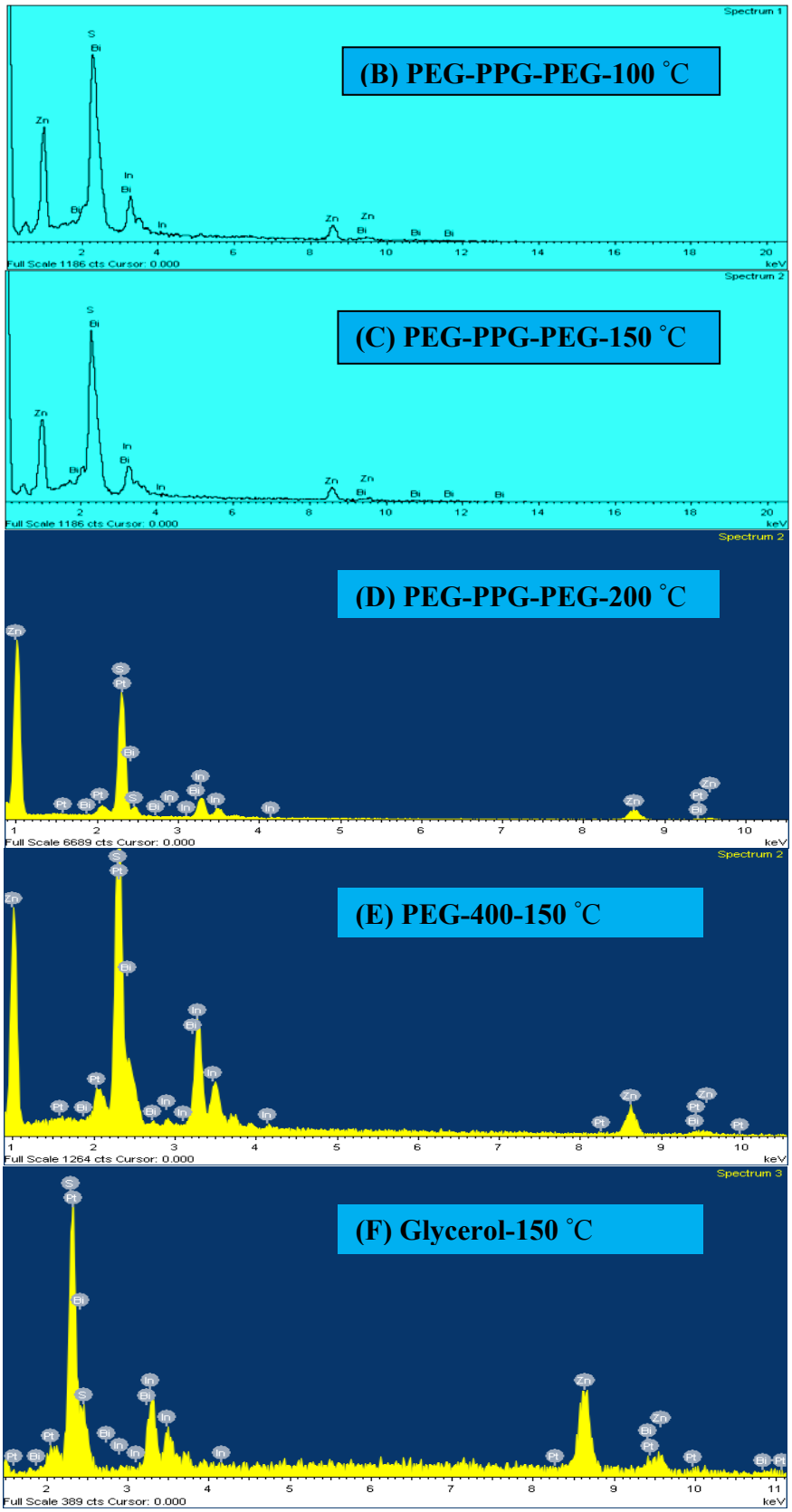

Fig. S7 EDX Line Spectra of BIZS

Table S1 Distribution of Elements percentage from EDX analysis

Sl	Catalyst-Solvent-Temperature	Element Weight (%)			
		Bismuth	Indium	Zinc	Sulfide
01	(B) PEG-PPG-PEG -100 ˚C	24.51	20.56	33.28	21.64
02	(C) PEG-PPG-PEG -150 ˚C	27.87	19.69	29.95	22.49
03	(D) PEG-PPG-PEG -200 ˚C	9.66	38.80	23.56	27.98
04	(E) PEG-400-150 ˚C	11.59	28.91	29.51	22.39
05	(F) Glycerol -150 ˚C	11.99	36.78	12.13	31.78

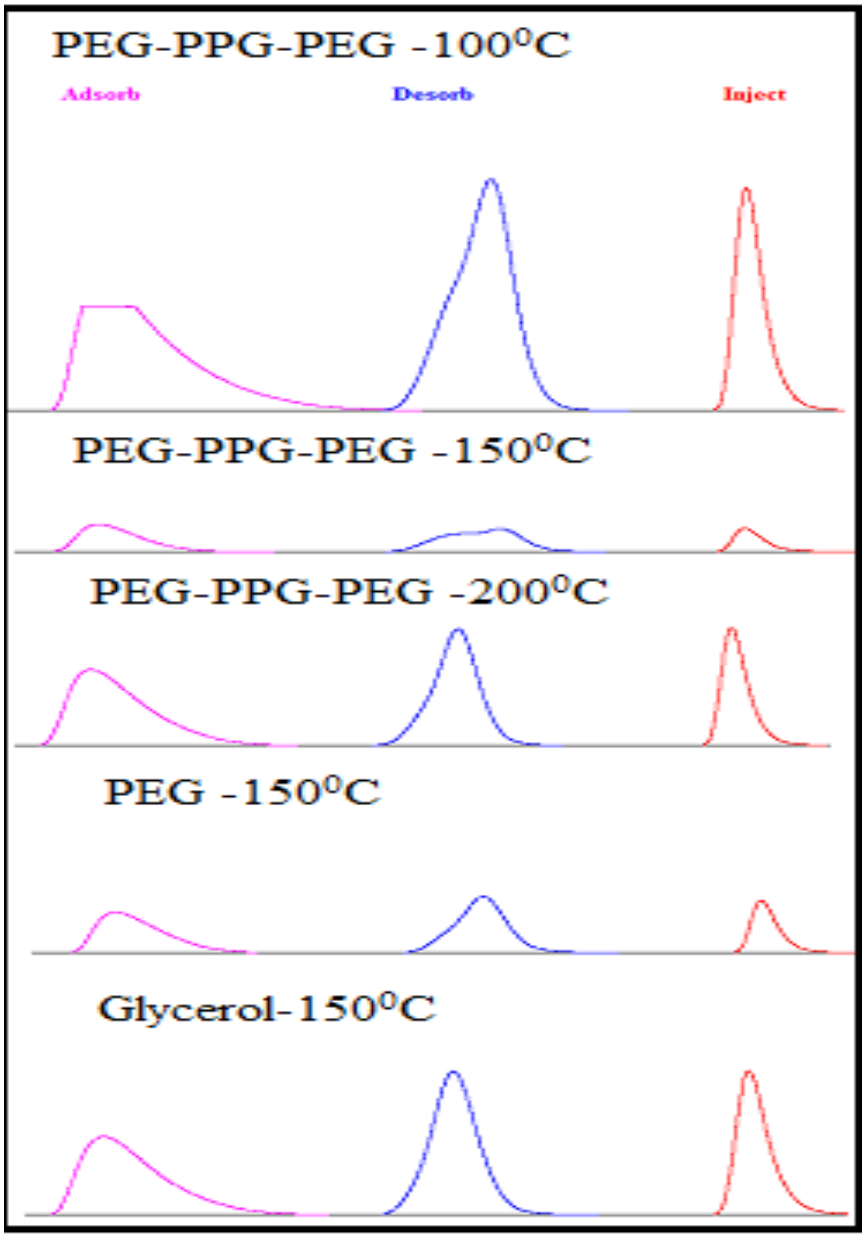

Fig. S8 BET analysis of prepared BIZS.

Table S2 Thermogravimetry decay of BIZS.

Sl. No	Catalyst-Solvent Temperature	1st degradation		2nd degradation	
		Temp (^{0}C)	%Wt Remaining	Temp (^{0}C)	%Wt Remaining
01	(B) PEG-PPG-PEG 100 ˚C	373.74	95.11	440.90	90.86
02	(C) PEG-PPG-PEG 150 ˚C	393.19	91.04	457.75	87.80
03	(D) PEG-PPG-PEG 200 ˚C	388.16	91.04	N/A	N/A
04	(E) PEG-400 150 ˚C	415.42	81.05	N/A	N/A
05	(F) Glycerol 150 ˚C	367.36	91.59	421.16	87.34

Table S3 Degradation of MB at various reaction conditions (light source).

Catalyst-Solvent Temperature	200W lamp		Sunlight [with (D)]	
	% MB consumed	% MB Remaining	% MB consumed	% MB Remaining
(B) PEG-PPG-PEG, 100 ˚C	14.3	85.7	93.6	6.4
(C) PEG-PPG-PEG ,150 ˚C	80.1	19.9		
			Blank MB with Sunlight	
			15.1	84.9
(D) PEG-PPG-PEG, 200 ˚C	92.2	7.8		
(E) PEG-400,150 ˚C	87.9	12.1		
			Blank MB with 200W	
			3.3	96.7
(F) Glycerol, 150 ˚C	19.3	80.7		

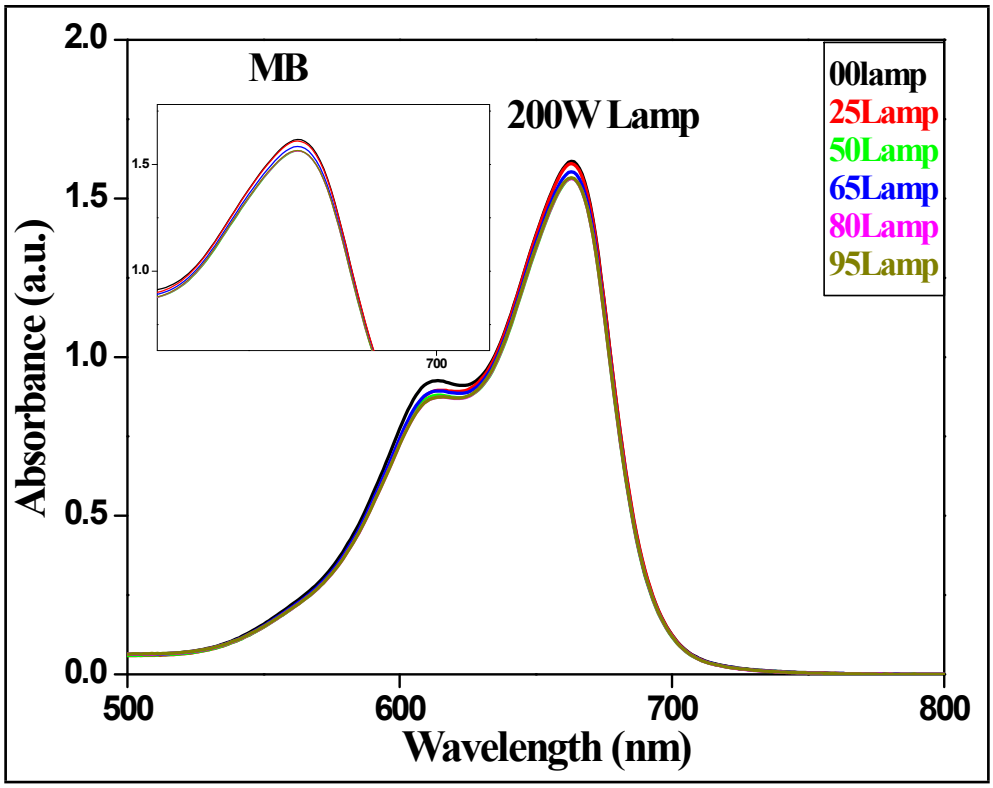

Fig. S9 Methylene Blue without BIZS in presence of 200W lamp.

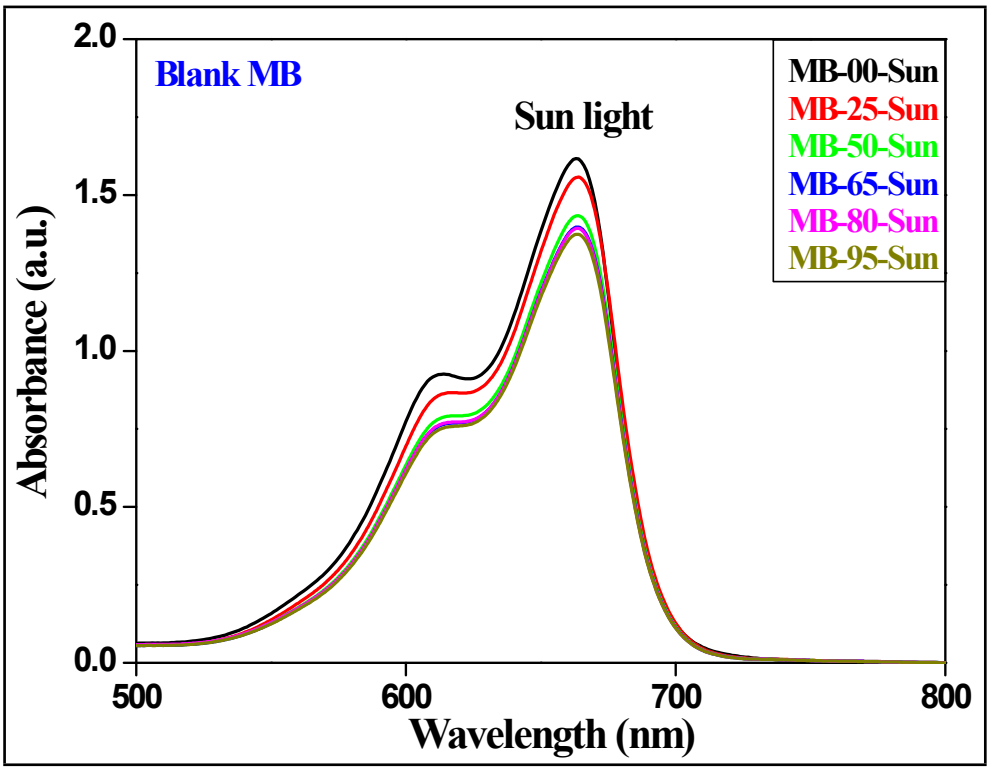

Fig. S10 Methylene Blue without BIZS in presence of sunlight.

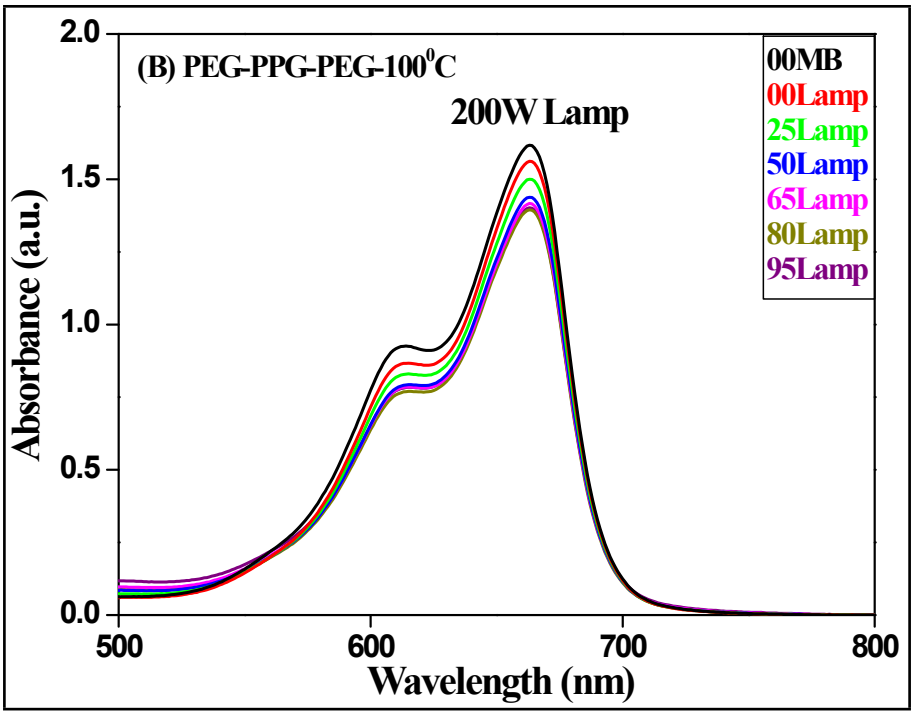

Fig. S11 Methylene Blue with BIZS prepared at 100 ˚C using PEG-PPG-PEG as solvent in presence of 200W lamp.

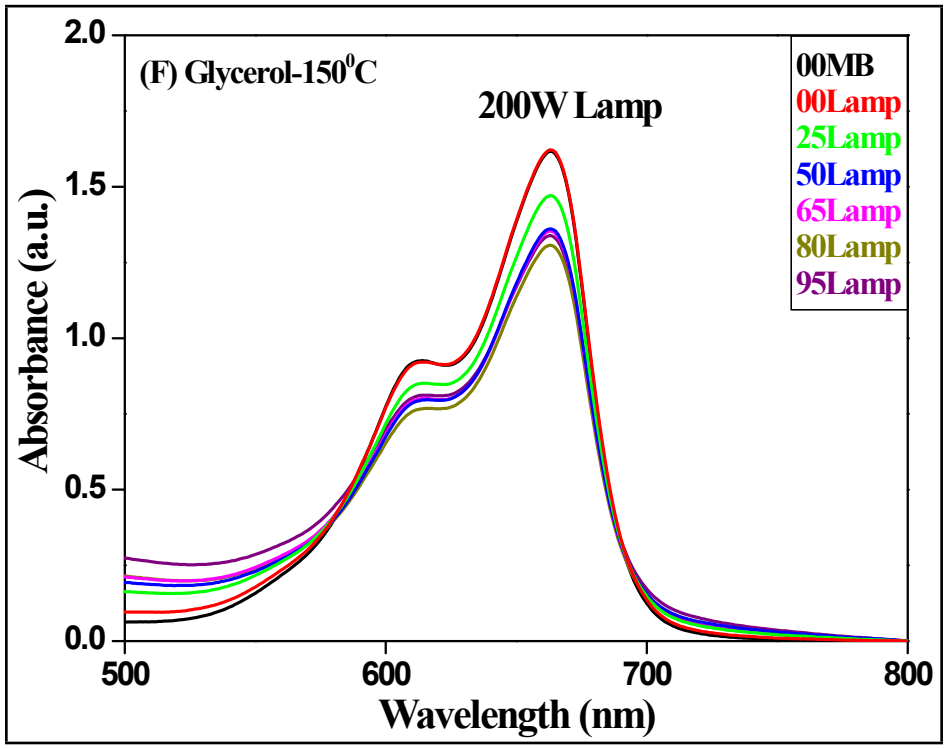

Fig. S12 Methylene Blue with BIZS prepared at 150 ˚C using glycerol as solvent in presence of 200W lamp.

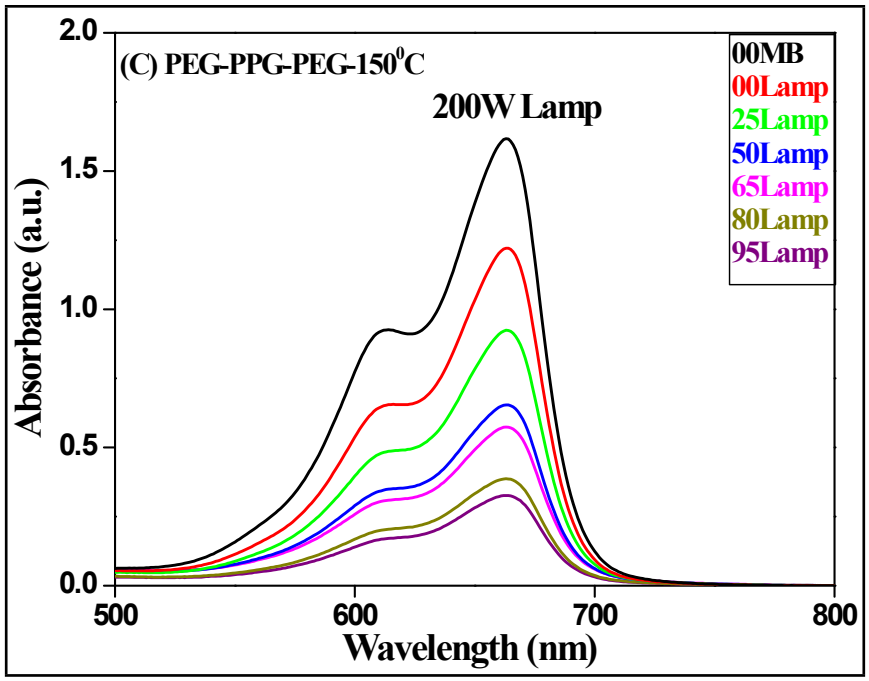

Fig. S13 Methylene Blue with BIZS prepared at 150 ˚C using PEG-PPG-PEG as solvent in presence of 200W lamp.

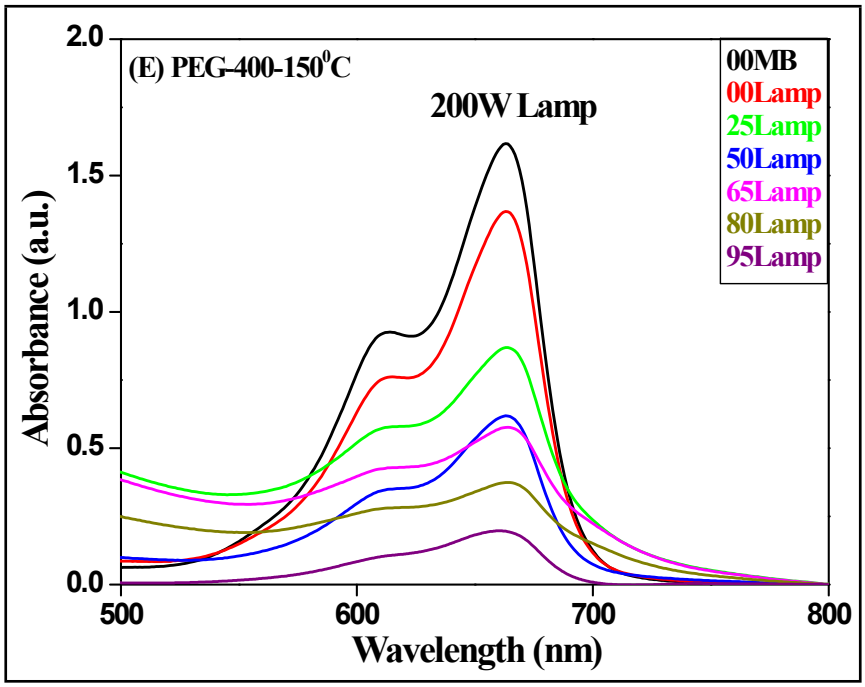

Fig. S14 Methylene Blue with BIZS prepared at 150 ˚C using PEG-400 as solvent in presence of 200W lamp.

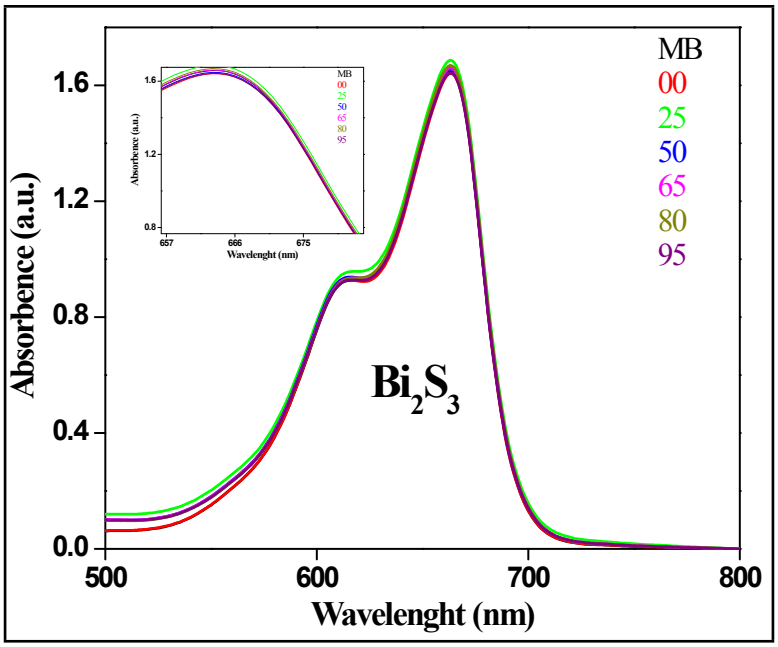

Fig. S15 Methylene Blue with Bi_2S_3 prepared at 200 ˚C using PEG-PPG-PEG as solvent in presence of 200W lamp.

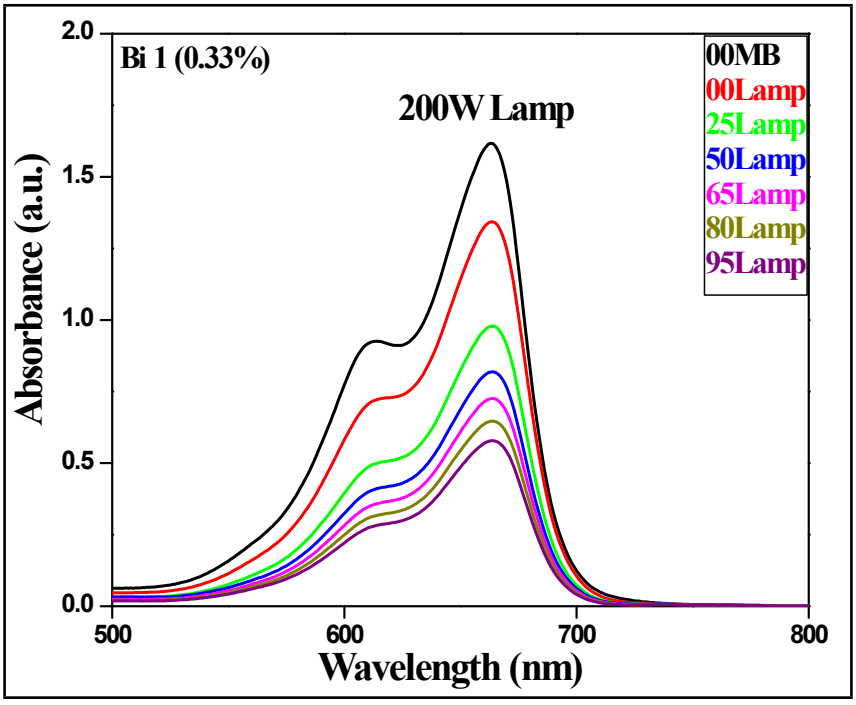

Fig. S16 Methylene Blue with BIZS (Bi: 0.33%) prepared at 200 ˚C using PEG-PPG-PEG as solvent in presence of 200W lamp.

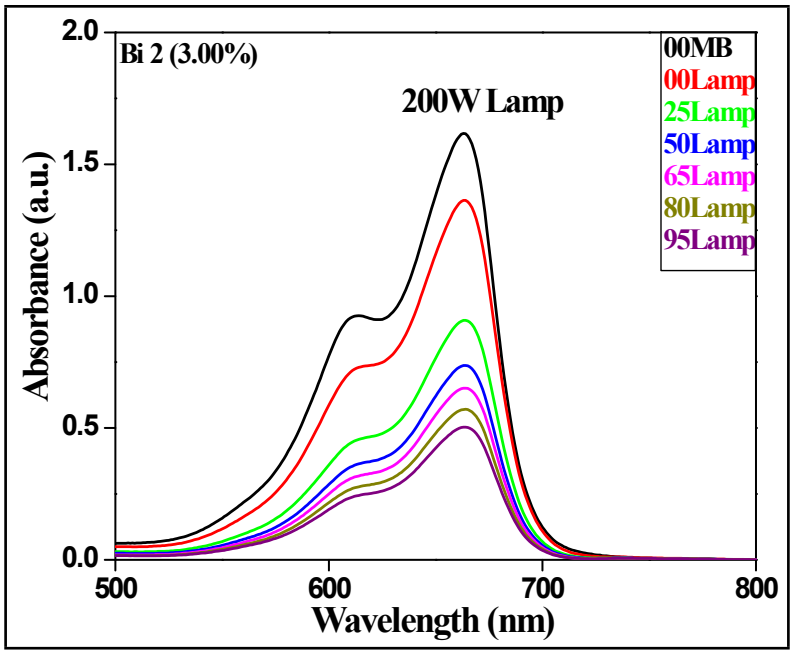

Fig. S17 Methylene Blue with BIZS (Bi: 3.00%) prepared at 200 ˚C using PEG-PPG-PEG as solvent in presence of 200W lamp.

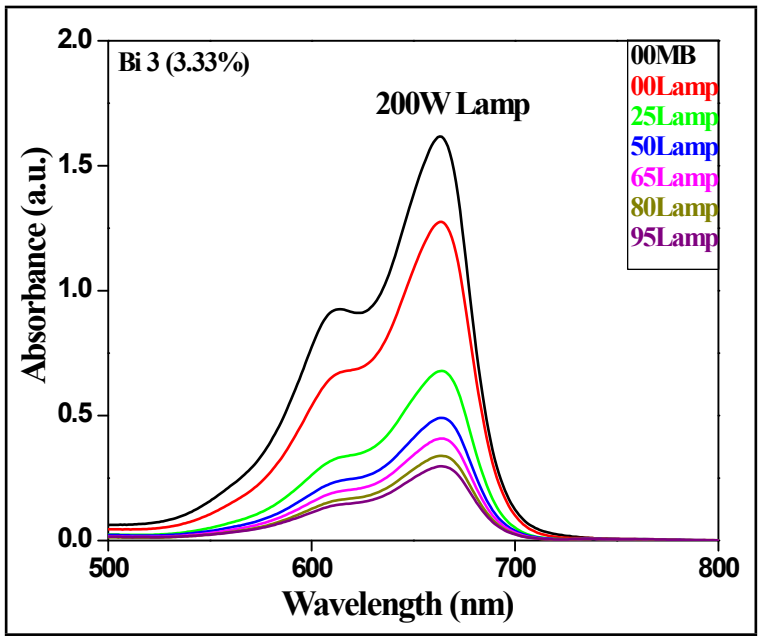

Fig. S18 Methylene Blue with BIZS (Bi: 3.33%) prepared at 200 ˚C using PEG-PPG-PEG as solvent in presence of 200W lamp.

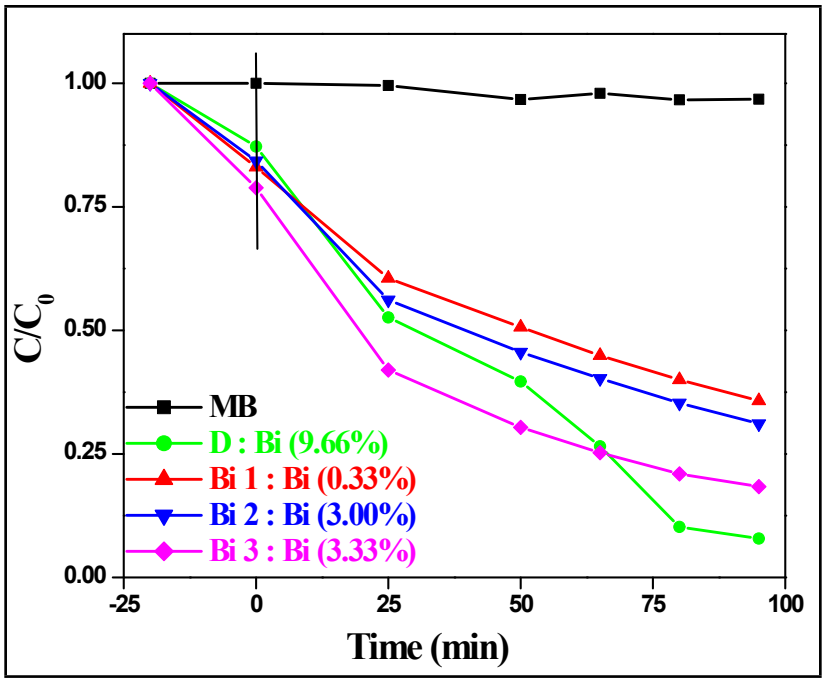

Fig. S19 Methylene Blue with BIZS prepared at 200 ˚C using PEG-PPG-PEG as solvent in presence of 200W lamp.

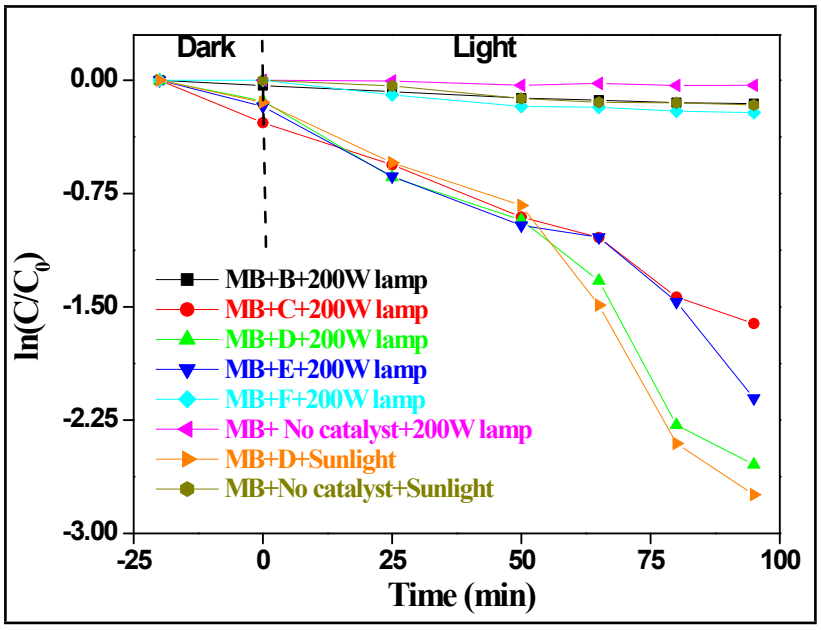

Fig. S20 Photodegradations of MB, (C/C_0) versus irradiation time under visible light.