

**TABLE 1:** The lattice parameters of pure CdS and **Mg-Mn Codoped CdS**

Sample	Structure	Lattice constants (Å)	Lattice angles (o)	Average Crystalline size (nm)	Calculated density (g/cm <sup>3</sup> )
Pure CdS	Hexagonal	a=b=4.136 c=6.713	$\alpha=\beta=90$ $\gamma=120$	49.08	4.82
Mg <sub>1%</sub> -Mn <sub>2%</sub> -CdS	Hexagonal	a=b=4.139 c=6.717	$\alpha=\beta=90$ $\gamma=120$	48.26	4.82
Mg <sub>3%</sub> -Mn <sub>2%</sub> -CdS	Hexagonal	a=b=4.14 c=6.719	$\alpha=\beta=90$ $\gamma=120$	46.34	4.82
Mg <sub>5%</sub> -Mn <sub>2%</sub> -CdS	Hexagonal	a=b=4.144 c=6.722	$\alpha=\beta=90$ $\gamma=120$	42.94	4.82
Mg <sub>7%</sub> -Mn <sub>2%</sub> -CdS	Hexagonal	a=b=4.146 c=6.726	$\alpha=\beta=90$ $\gamma=120$	39.26	4.88

**Table 2.** Comparison of optical properties (band gap and PL intensity) and photocatalytic degradation activity of pure CdS and samples of Mg–Mn co-doped CdS

No	Catalyst	Bandgap eV	PL intensity (a.u.)	% Degradation
1	Pure CdS	2.8 eV	557	42
2	Mg <sub>1%</sub> -Mn <sub>2%</sub> -Cds	2.63 eV	416.39	54.66
3	Mg <sub>3%</sub> -Mn <sub>2%</sub> -Cds	2.53eV	310	68
4	Mg <sub>5%</sub> -Mn <sub>2%</sub> -Cds	2.19eV	203	85
5	Mg <sub>7%</sub> -Mn <sub>2%</sub> -Cds	2.37eV	253.5	77

**Table 3.** Shows the first order kinetic constant “k” and regression analysis for pure CdS and Mg and Mn Codoped CdS nanoparticles.

<b>No</b>	<b>Photocatalysts</b>	<b>Rate constants “k” (min<sup>-1</sup>)</b>	<b>Correlation coefficients R<sup>2</sup></b>
<b>1</b>	Pure CdS	0.0048	0.9866
<b>2</b>	Mg <sub>1%</sub> -Mn <sub>2%</sub> -CdS	0.00567	0.9793
<b>3</b>	Mg <sub>3%</sub> -Mn <sub>2%</sub> -CdS	0.00884	0.9812
<b>4</b>	Mg <sub>5%</sub> -Mn <sub>2%</sub> -CdS	0.01403	0.9804
<b>5</b>	Mg <sub>7%</sub> -Mn <sub>2%</sub> -CdS	0.00963	0.9853

**Table S4. Comparison between photocatalytic and antimicrobial performance of CdS-based materials.**

<i>Sr No.</i>	<b>Dopant System</b>	<b>Light Source &amp; Conditions</b>	<b>Catalyst Loading/test</b>	<b>Photocatalytic Performance (k or % MB Removal)</b>	<b>Antimicrobial Activity</b>	<b>References</b>
1.	Zn-Doped CdS	Solar Light,	1.5 g L <sup>-1</sup>	88% degradation of MB	Not Reported	[49]
2	(CdS QDs)	Xe-lamps 100 W.	20 mg	80% 2-chlorophenol (2-CP)	both E. coli & A. hydrophila 20 mm	[64]
3.	Ni-doped Cd <sub>0.9</sub> Zn <sub>0.1</sub> S	Halogen lamp 300 W	0.4 g L <sup>-1</sup>	88% degradation of MB	E. coli – 18 mm; S. aureus – 14 mm	[57]
4.	CdS-TiO <sub>2</sub> nanocomposite	500 W Halogen light	1 g L <sup>-1</sup>	84% degradation of Acid Blue-29	Not Reported	[65]
5.	Mn-doped CdS	Visible Light	1.0 g L <sup>-1</sup>	~87% degradation of MB	Not Reported	[28]
6.	Mn-doped CdS	Blue LED (450 nm, 10 mW cm <sup>-2</sup> )	0.3 g L <sup>-1</sup>	89% degradation of Tetracycline	Not reported	[66]
7.	Pure CdS (Our Work)	300 W Xenon Lamp	(0.5, 1.0, 1.5) g L <sup>-1</sup>	36%, 42%, 47%	E. coli: 13.5 ± 0.3, S. aureus: 34 ± 0.4	This Work
8.	Mg <sub>5%</sub> -Mn <sub>2%</sub> -CdS	300 W Xenon Lamp	(0.5, 1.0, 1.5) g L <sup>-1</sup>	(81%, 84.79%, 89%)	E. coli: 17 ± 0.2, S. aureus: 40 ± 0.3	This Work