Table S1. Kinetics, isotherm models and equations used for thermodynamic analysis.

models	Formula	Parameters	Eqs
PFO	$\ln\left(\frac{C_0}{C_t}\right) = k_1 t$	C_0 and C_t (mg/L): initial and current concentration of CV. k_1 (min^{-1}): photodegradation rate constant of PFO model.	(5)
PSO	$\frac{1}{C_t} - \frac{1}{C_0} = k_2 t$	k_2 (L/mg.min): photodegradation rate constant of PSO model.	(6)
Langmuir	$q_e = (q_{max} K_L C_e)/(1 + K_L C_e)$	C_e (mg/L): equilibrium concentration of the resting CV dye in solution. q_{max} (mg/g): maximum adsorption capacity. K_L (L/mg) : Langmuir constant.	(7)
Freundlich	$q_e = K_F {C_e}^{1/n}$	K_F (mg/g): Freundlich constant. n: heterogeneity factor.	(8)
Distribution coefficient (K_d)	$K_d = \frac{q_e}{C_e}$	q_e (mg/g): adsorption capacity at equilibrium. C_e (mg/L): equilibrium concentration of the resting CV dye.	(9)
Free enthalpy (ΔG°)	$\Delta G° = -RT lnK_d$	R (~ 8.314 J/mol.K): the universal constant of gasses. T (°K): the absolute temperature.	(10)
Linear fit (Van ’t Hoff law)	$lnK_d = \frac{\Delta S°}{R} - \frac{\Delta H°}{RT}$	ΔS° (J/mol.K): standard entropy ΔH° (kJ/mol): standard enthalpy	(11)

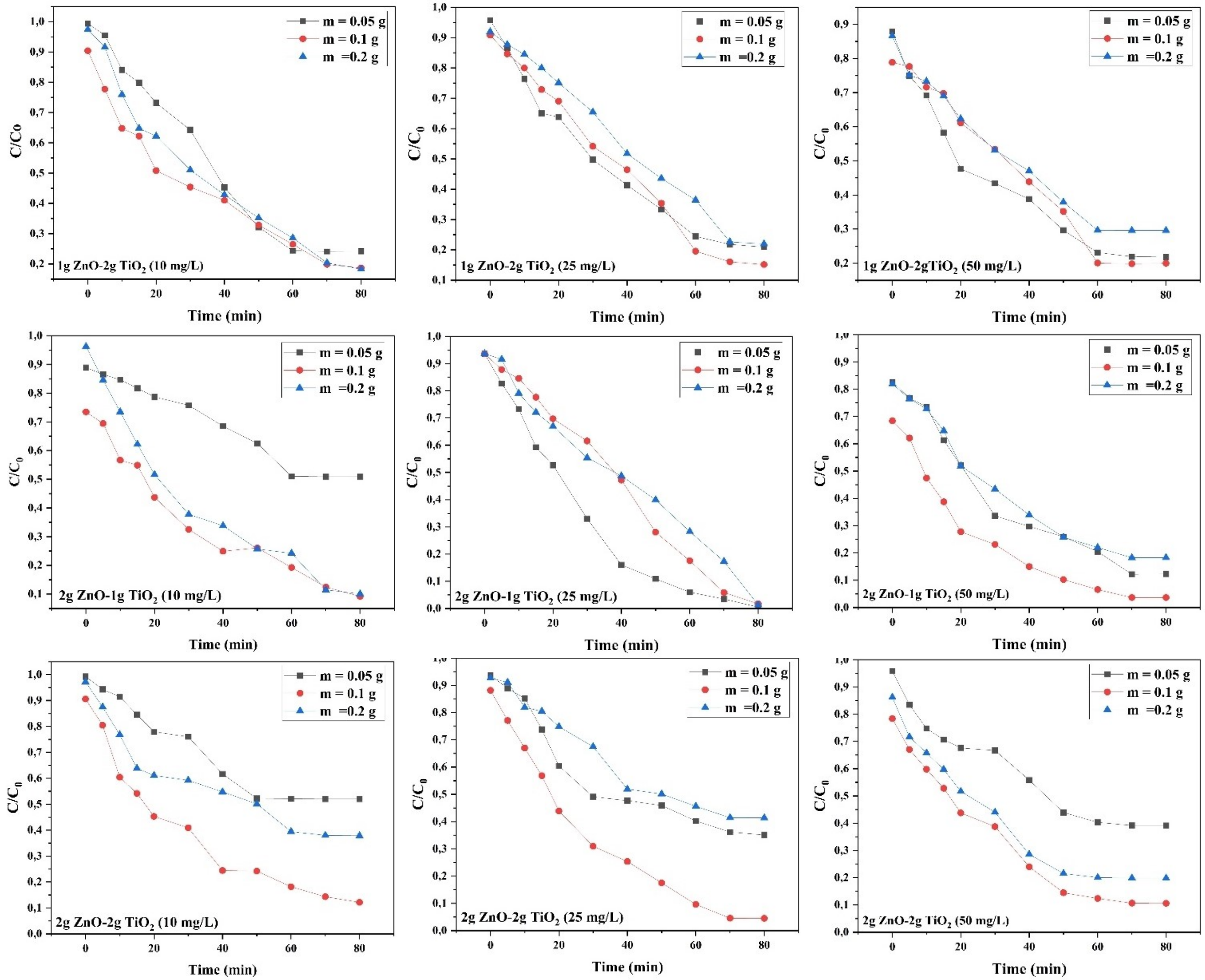

Figure S1. Impact of initial CV dye concentration on its removal over time using three different ZnO/TiO_2-CaAlg nanoparticles.

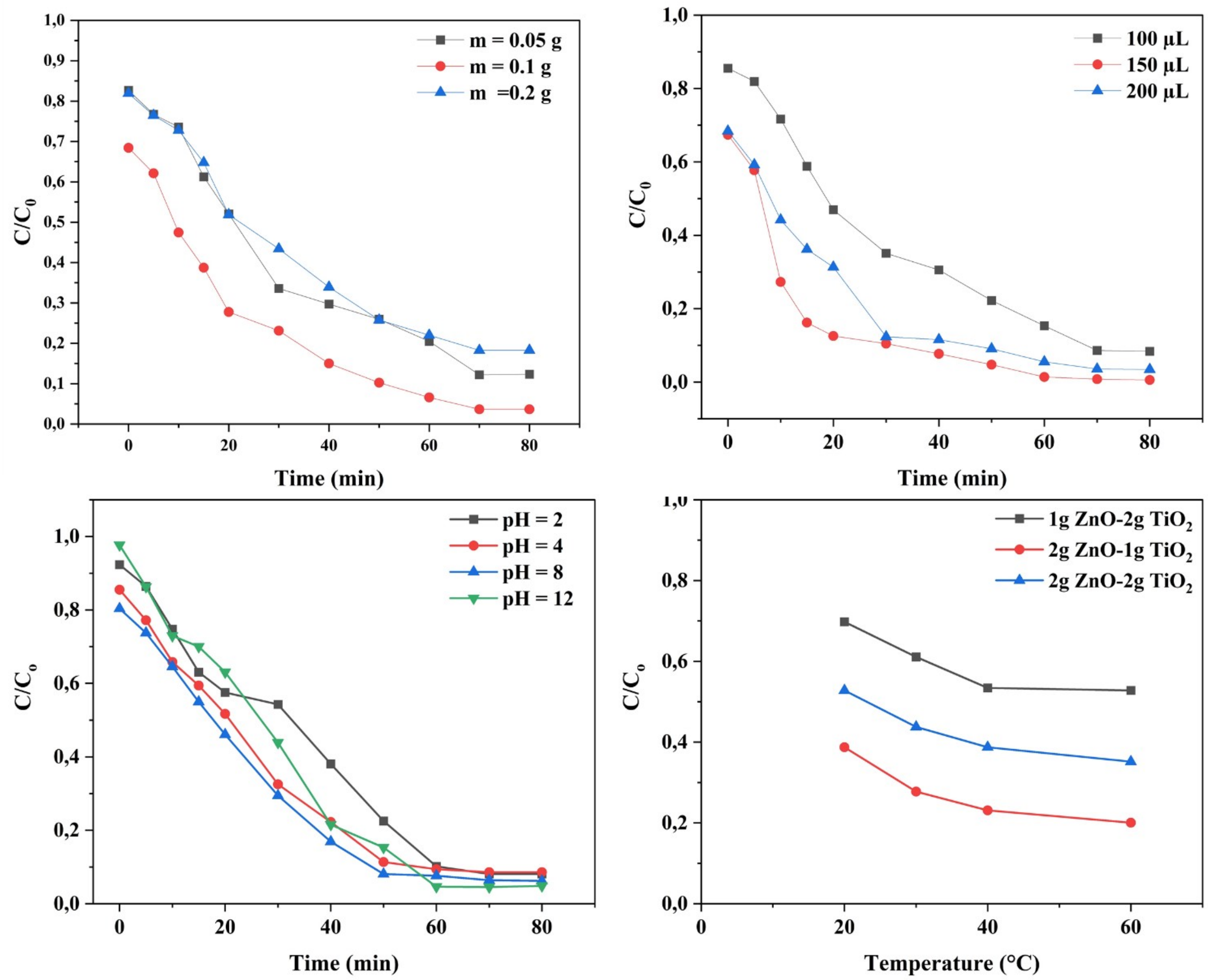

Figure S2. Effects of operating parameters (catalyst mass, H_2O_2 volume, pH, and temperature) on the adsorption/photocatalytic degradation of CV dye using 2 g ZnO/1 g TiO_2–CaAlg. ($V_{solution}$ = 300 ml, $C_{solution}$ = 50 ppm, t = 70 min)

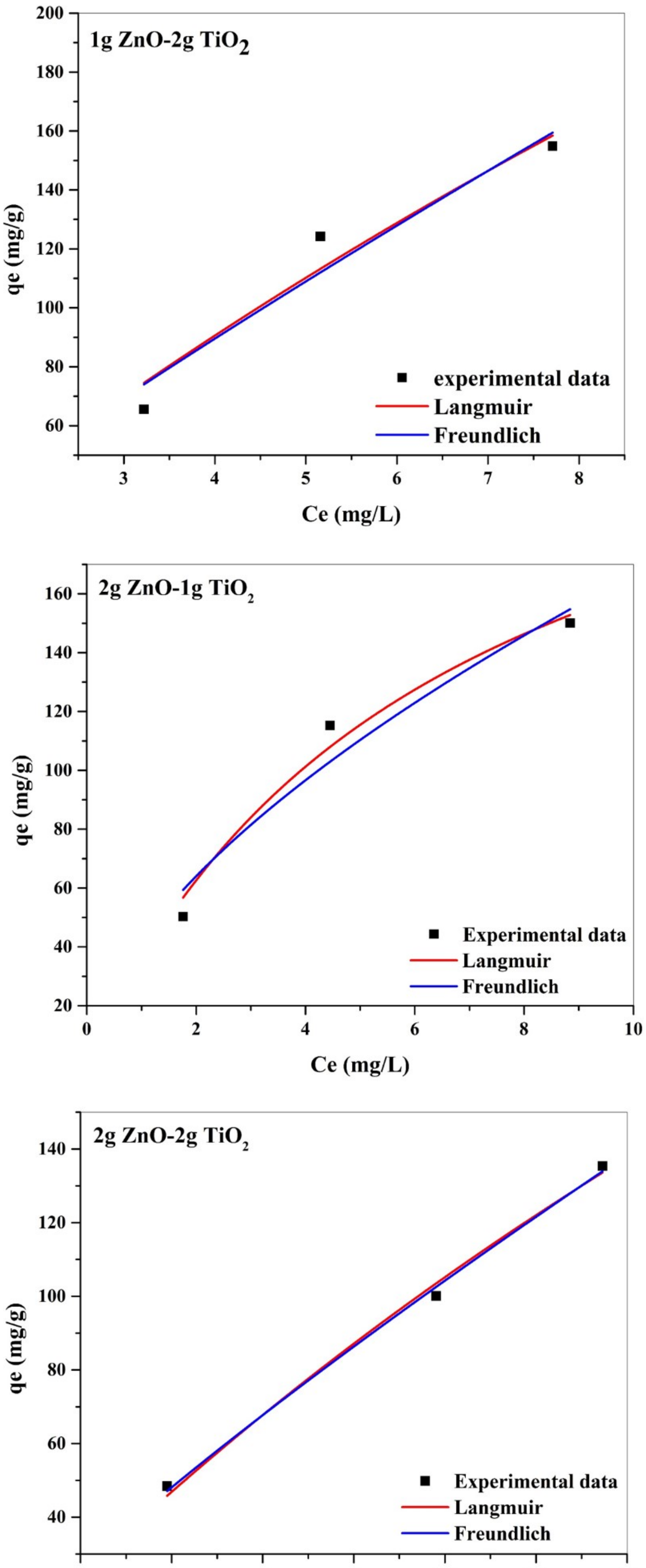

Figure S3. Isotherm modeling of adsorption/ photocatalytic degradation of CV dye.

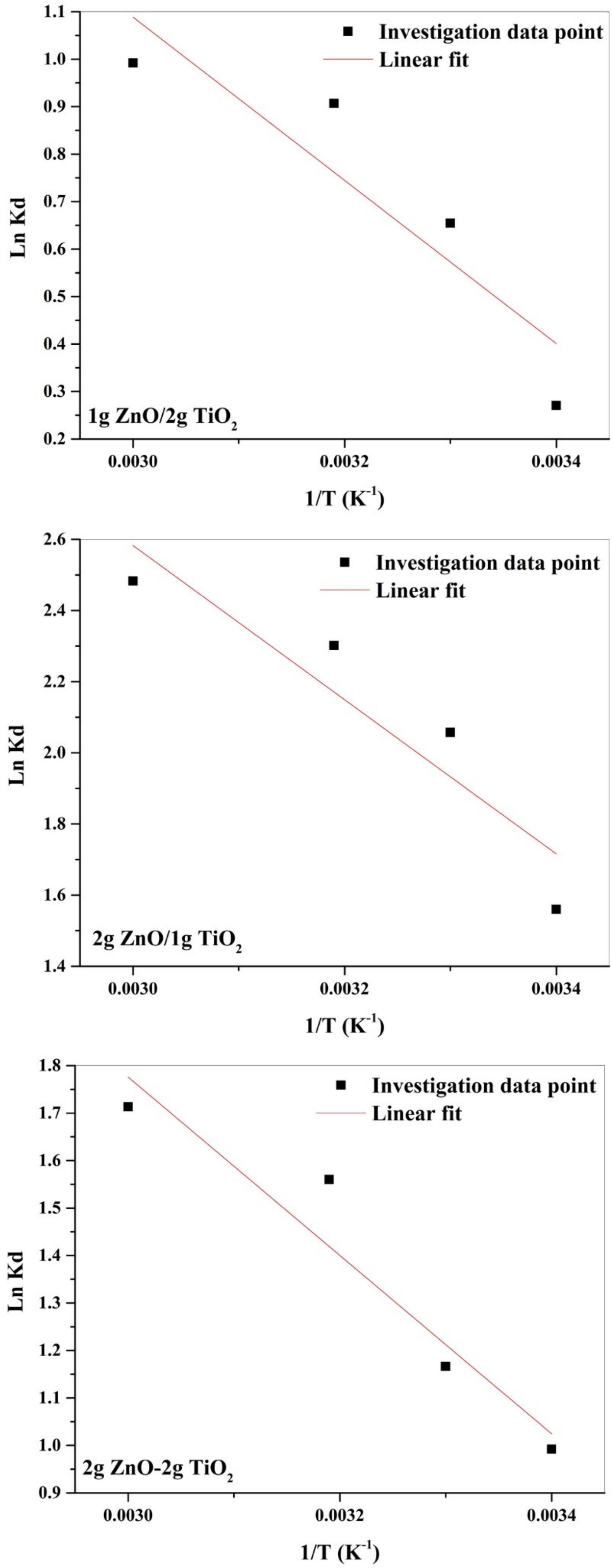

Figure S4. Van't Hoff plots.