NOMENCLATURE

a	specific interfacial area, (m^{-1})
c	molar concentration, (mol/L)
d_b	mean bubble diameter, (m)
D	optical density, D=μl, (-)
D_i	diffusivity of *i*-th component, (m^2/s)
E	enhancement factor, (-)
f_i	fraction of radiation absorbed by species i, (-)
F	light absorption efficiency, $F=[1-\exp(-2.3\varepsilon_H c_H l_{eff})]$, (-)
h	liquid tower height, (m)
I_0	incident photon flow rate, (Ei/L·s)
k_{app}	apparent rate constant, (s^{-1})
$k_{i,OH}$	2^{nd} order rate constant of component i with OH radicals, (L/mol·s)
K_La	overall volumetric mass transfer coefficient, (s^{-1})
l	optical path length, (cm)
m	dimensionless Henry's constant, (-)
N	gas absorption rate, (mol/L·s)
P	UV lamp power, (W)

Q	flow rate, (L/s)
r_i	degradation rate of component i, (mol/L·s)
R	$R=k_{app}/K_La$, (-)
S	degree of saturation of the liquid phase, (-)
T	temperature, (K, °C)
$u_{G,L}$	superficial gas/liquid velocity, (m/s)
V	volume, (L)

Greek letters

α	factor to account for the increase in mass transfer coefficient, (Eq.6-8)
δ	liquid side film thickness, (m)
ε_G	gas hold-up, (-)
ε_i	molar absorption coefficient of i-th phase, (L/mol·cm)
ϕ	quantum yield, (-)
μ	attenuation coefficient, $\varepsilon_i c_i$, (cm^{-1})
ρ	density, (kg/L)
η	viscosity, (Pa s)
σ	surface tension, (N/m)

Subscript/superscript

app	apparent
d	with deactivation
eff	effective
G/L	gas/liquid phase
H	hydrogen peroxide
IN/OUT	inlet/outlet
OH	hydroxyl radical

p	primary
P	tetrachloroethylene
q	quartz
rct	reactor
0	approximated to time = 0

Dimensionless numbers

Bo	Bodenstein number ($gd_R^2\rho_L/\sigma$)
Da	Damkohler number, ($K_L aV/Q$)
Ga	Gallilei number ($gd_R^3\rho_L/\eta_L$)
Re	Reynolds number, ($\rho ug/\eta$)
Sc	Schmidt number, ($\eta/(D\rho)$)
Sh	Sherwood number, ($k_L ad_R^2/D$)