Supporting Information

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COMPARISON OF H_2O_2/UV AND TiO_2/UV PROCESSES FOR THE DEGRADATION OF DICHLOROACETIC ACID IN WATER

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The RTE valid for heterogeneous and homogeneous systems is

$$\frac{dI_{\lambda,\mathbf{\Omega}}(\mathbf{x},t)}{ds} = \underbrace{-\kappa_\lambda(\mathbf{x},t)I_{\lambda,\mathbf{\Omega}}(\mathbf{x},t)}_{\text{ABSORPTION}} - \underbrace{\sigma_\lambda(\mathbf{x},t)I_{\lambda,\mathbf{\Omega}}(\mathbf{x},t)}_{\text{OUT-SCATTERING}} + \underbrace{j^e_\lambda(\mathbf{x},t)}_{\text{EMISSION}} + \underbrace{\frac{\sigma_\lambda(\mathbf{x},t)}{4\pi}\int_{\Omega'} I_{\lambda,\mathbf{\Omega}'}(\mathbf{x},t)\,p_\lambda(\mathbf{\Omega}'\to\mathbf{\Omega})\,d\Omega'}_{\text{IN-SCATTERING}} \tag{S1}$$

This is a tri-dimensional, pseudo-homogeneous radiative transfer equation along the direction of propagation $\mathbf{\Omega}$, having "s" as the parameter of the directional derivative, valid for monochromatic radiation, with elastic, multiple and independent scattering. $I_{\lambda,\mathbf{\Omega}}(\mathbf{x},t)$ is the specific spectral intensity. $\kappa_\lambda(\mathbf{x},t)$ is the linear, volumetric absorption coefficient and $\sigma_\lambda(\mathbf{x},t)$ is the linear, volumetric scattering coefficient. $\mathbf{\Omega}$ is a unit vector in the direction of radiation propagation, $\mathbf{\Omega}'$ represents all the directions different from $\mathbf{\Omega}$ that contribute to in-scattering into the $\mathbf{\Omega}$ direction, and $p_\lambda(\mathbf{\Omega}'\to\mathbf{\Omega})$ is the phase function for elastic scattering, that gives the photon distribution function of scattering in the tri-dimensional space. Since radiation propagates at the speed of the light, the transient term has been neglected. However $I_{\lambda,\mathbf{\Omega}}(\mathbf{x},t)$ is still a function of time because all the parameters in the RTE can be a function of time. At normal "ambient" temperatures, internal emission is negligible $\left[j^e_\lambda(\mathbf{x},t)\cong 0\right]$. Equation S1 indicates that the specific spectral intensity is a function of six variables: three spatial variables (x_1 ,x_2 ,x_3), two angular variables for the direction of radiation propagation (θ,ϕ), and the wavelength distribution of the radiation under analysis (λ).

The solution of eq S1 renders the values of specific intensity for every spatial point **x** and every direction $\mathbf{\Omega}$ in the reactor space. Then, from $I_{\lambda,\mathbf{\Omega}}(\mathbf{x},t)$, we can calculate the spectral incident radiation G_λ, defined as

$$G_\lambda(\mathbf{x},t) = \int_\Omega I_{\lambda,\mathbf{\Omega}}(\mathbf{x},t)d\Omega \tag{S2}$$

Finally, the LVRPA, required to compute the quantum efficiencies, is given by

$$e_{\lambda}^{a}(\mathbf{x},t) = \kappa_{\lambda}(\mathbf{x},t)\, G_{\lambda}(\mathbf{x},t) \tag{S3}$$

When polichromatic radiation is employed, the LVRPA averaged over the wavelength range can be calculated with the following equation:

$$e_{\Sigma\lambda}^{a}(\mathbf{x},t) = \int_{\lambda} \kappa_{\lambda}(\mathbf{x},t) G_{\lambda}(\mathbf{x},t)\, d\lambda \tag{S4}$$