2024 specialty crop block grant application

Project Title: facilitate the industrial implementation and scale-up of adsorption debittering technology for HLB-infected orange and grapefruit juices

Model Equations	**Equation number**
$t_e = \frac{V_e}{Q}$	(1)
$t_\delta = \frac{V_e - V_b}{Q}$	(2)
$f = \frac{\int_{V_b}^{V_e}(C_0 - C_b)dV}{C_0(V_e - V_b)}$	(3)
$t_f = t_\delta(1 - f)$	(4)
$\frac{\delta}{Z} = \frac{t_\delta}{t_e - t_f} = \frac{t_\delta}{t_e + t_\delta(f - 1)} = \frac{V_e - V_b}{V_b + f(V_e - V_b)}$	(5)
$\%\ saturation = \frac{z + \delta(f - 1)}{z} x100\%$	(6)
$t = \frac{N_0 Z}{C_0 v} - \frac{1}{K_a C_0} \ln\left(\frac{C_0}{C_b} - 1\right)$	(7)
$t = m_x - C_x$	(8)
with the slope $m_x = \frac{N_0}{C_0 v}$	(9)
and the intercept $C_x = -\frac{1}{K_a C_0} \ln\left(\frac{C_0}{C_b} - 1\right)$	(10)
$Z_0 = \frac{v}{k_a N_0} \ln\left(\frac{C_0}{C_b} - 1\right)$	(11)
$q_b = \int_0^{V_b} \frac{(C_0 - C_b)}{m}$	(12)
$q_e = q_b + \int_{V_b}^{V_e} \frac{(C_0 - C_e)}{m}$	(13)
$degree\ of\ column\ utilization\ (\%) = \frac{q_b}{q_e} x100\%$	(14)
$EBRT\ (\min) = \frac{bed\ volume\ (cm^3)}{volumetric\ flow\ rate\ (cm^3/min)}$	(15)

$$exhaustion\ rate = \frac{weight\ of\ adsorbent\ used\ (g)}{volume\ of\ liquid\ treated\ at\ breakthrough\ (L)} \quad (16)$$

$$(x-\alpha)(y-\beta) = \gamma \quad (17)$$

$$y = \frac{\gamma}{x-\alpha} + \beta \quad (18)$$

$$R = \frac{R_{max}}{\left(1 + 10^{(N_{BV1/2} - N_{BV}) \times hl}\right)} \quad (19)$$

$$U_{mf} = \frac{\mu_g}{\rho_g d_p}\left(\sqrt{33.7^2 + 0.0408Ar} - 33.7\right. \quad (20)$$

$$f_1 = 1 - \frac{[A\left(\frac{G}{F}\right) - B/2]^2}{A(Z-C) + {B^2}/{4}} \quad (21)$$

$$\frac{\partial(\rho_L \epsilon_L)}{\partial t} + \nabla \cdot (\rho_L \epsilon_L \langle u_{Li} \rangle) = 0 \quad (22)$$

$$\frac{\partial(\rho_S \epsilon_S)}{\partial t} + \nabla \cdot (\rho_S \epsilon_s \langle u_{Si} \rangle) = 0 \quad (23)$$