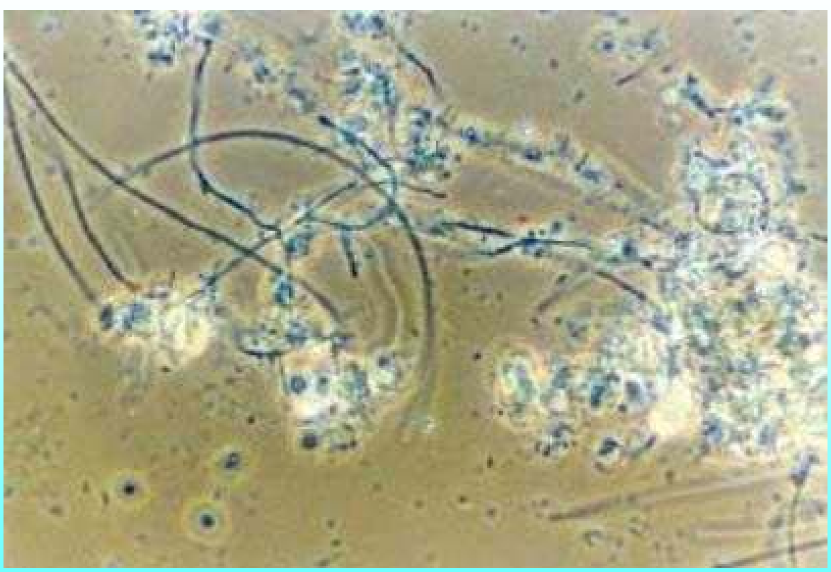
KINETIKA MICELARNOG RASTA



BERGTER F.
(*Z. Allgem. Mikrob. 18, 143, 1978*)

rast *Streptomyces hygroscopicus* na površini čvrstog substrata

$$\frac{dL}{dt} = k_1 * N \qquad 12\text{-}1$$

$$\frac{dN}{dt} = k_2 * L \qquad 12\text{-}2$$

$$\mu = \sqrt[2]{k_1 * k_2} \qquad 12\text{-}3$$

dalje... BERGTER F.
(*Z. Allgem. Mikrob. 18, 143, 1978*)

L = duljina hifa u jed. volumena
N = broj hifa u jedinici volumena

k_1 = relativna brzina produljivanja
k_2 = relativna brzina "grananja"
k_1, k_2 = f (S)

KINETKA BIOADSORPCIJE

MOSER A.

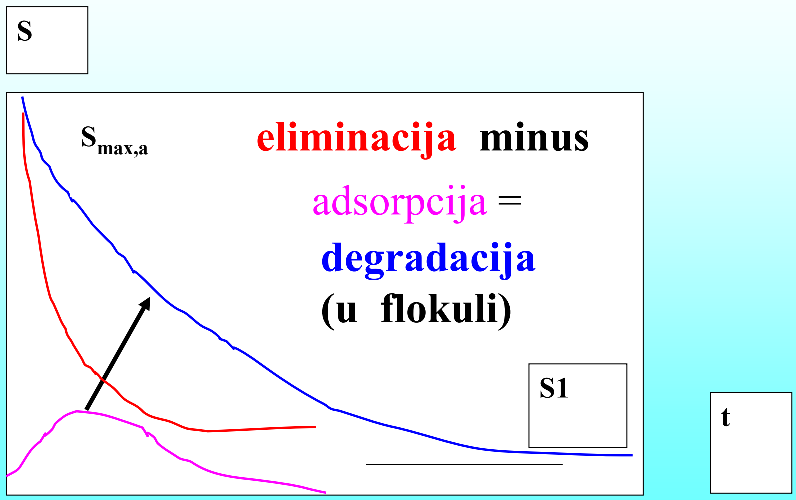
(***Thesis of habilitation TU Graz. 1977***)

THEOPHILOU i sur.

(*Gas-Wasser Fach/ Wasser-Abwasser 119, 135, 1978*)

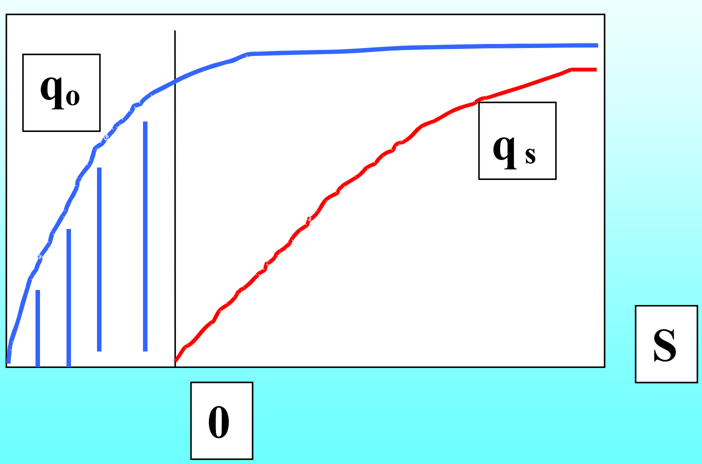
substrat se eliminira brzo iz tekuće faze adsorpcijom i "skladištenjem" u flokulama, a njegova razgradnja kasni

dalje.. **MOSER; THEOPHILOU**

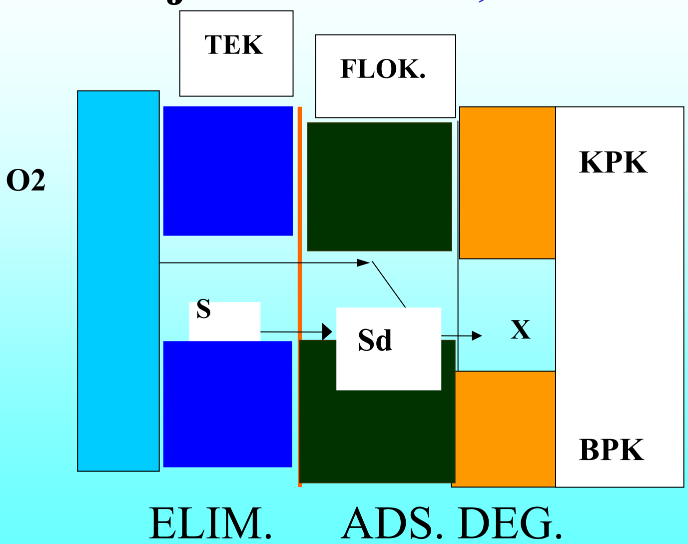


dalje.. **MOSER; THEOPHILOU**

q_o- trošenje O_2, q_s-trošenje S u vod.fazi



dalje.. MOSER; THEOPHILOU



$$\left(\frac{dS}{dt}\right)_{eff} = k_{0,\,a} * X \qquad 12\text{-}4$$

$$\left(\frac{dS}{dt}\right)_{el} = k_{el} * (S_{el} - S_1) \qquad 12\text{-}5$$

S_1 = S koji se ne degradira

$$\left(\frac{dS}{dt}\right)_{deg} = k_{deg} * (S_{deg} - S_1) \qquad 12\text{-}6$$

$$\left(\frac{dS}{dt}\right)_{ads} = \left(\frac{dS}{dt}\right)_{el} - \left(\frac{dS}{dt}\right)_{deg} \qquad 12\text{-}7$$

$$S_{el} = S_{deg} - S_1 + S_{ads} \qquad 12\text{-}8$$

$$S_{ads} = S_{max,a} * \frac{k\,(X * S_{deg,o} * \xi_{ads})}{1 + k*(X * S_{deg,o} * \xi_{ads})} \qquad 12\text{-}9$$

$$\xi_{ads} = 1 - \frac{S_{ad}}{S_{max,ad}} \qquad 12\text{-}10$$

KINETIKA RASTA U BIOFILMOVIMA I FLOKULAMA (HETEROGENA OKOLINA)

a_s = sp. površina aktivne biomase ($m^2 * m^{-3}$)

d_p = promjer čestice

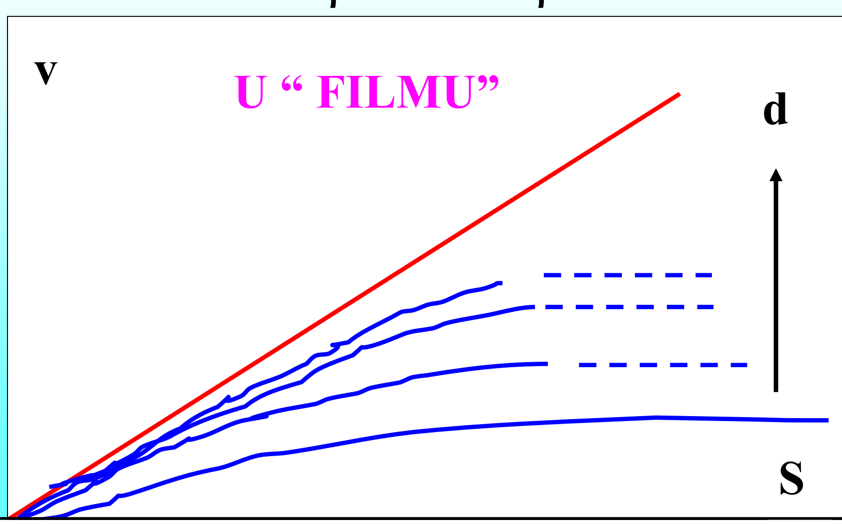
$D_{s,eff}$ = difuzijska konstanta

$$\frac{dS}{dt} = f(q_{s,max};K_s;\ S)\quad (kg\ m^{-3}\ h^{-1})$$

$$\left(\frac{dS}{dt}\right)^{\#} = f(q_{s,max};K_s;\ k_3;\ d_p;\ S)\ (kg\ m^{-2}\ h^{-1})$$

$$k_3 = \sqrt[2]{\frac{k_1 * a_s}{D_{s,eff}}} \qquad 12\text{-}11$$

$$q_s = \frac{dS}{dt} * \frac{A_s}{V*\rho} = \frac{dS}{dt} * \frac{a_s}{\rho} \qquad 12\text{-}12$$



FILM

d malen — **(pseudohomogeno)**

$$v^{\#} = \frac{v^{\#}_{max} * S}{K_s + S}$$

d velik — **(heterogeno)**

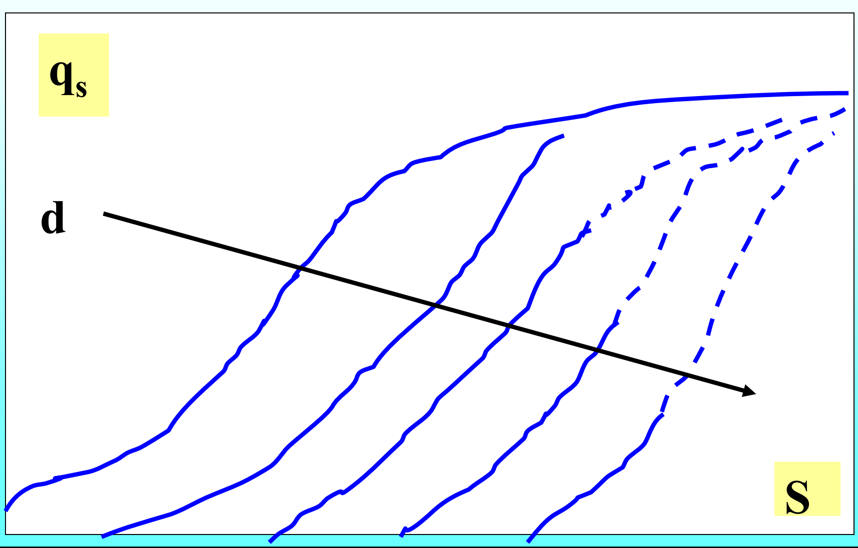
S malen →

$$v^{\#} = \frac{v^{\#}_{max} * S}{k_3}$$

S velik →

$$v^{\#} = v^{\#}_{max}$$

u FLOKULAMA



FLOKULE

↙ ↘

d_p **malen** (homogeno) → $$v = \frac{v_{max} * S}{K_s + S}$$

d_p **velik** (heterogeno)

- **S malen** → $$v = \frac{v_{max} * a * S}{k_3 * \rho}$$
- **S velik** → $$v = v_{max}$$

$$\left(\frac{dS}{dt}\right)^{\#} = f(\Phi * S / K_s) \; (kg\ m^{2}\ h^{-1})$$

Φ = Thiele-ov modul koji zamjenjuje k3 (odnos brzine reakcije i difuzivnosti)

$$\Phi = d_p \sqrt[2]{\frac{k_r * S^{n-1}}{D_{s,eff}}} = \sqrt[2]{Da_{II}} \qquad \textbf{12-13}$$

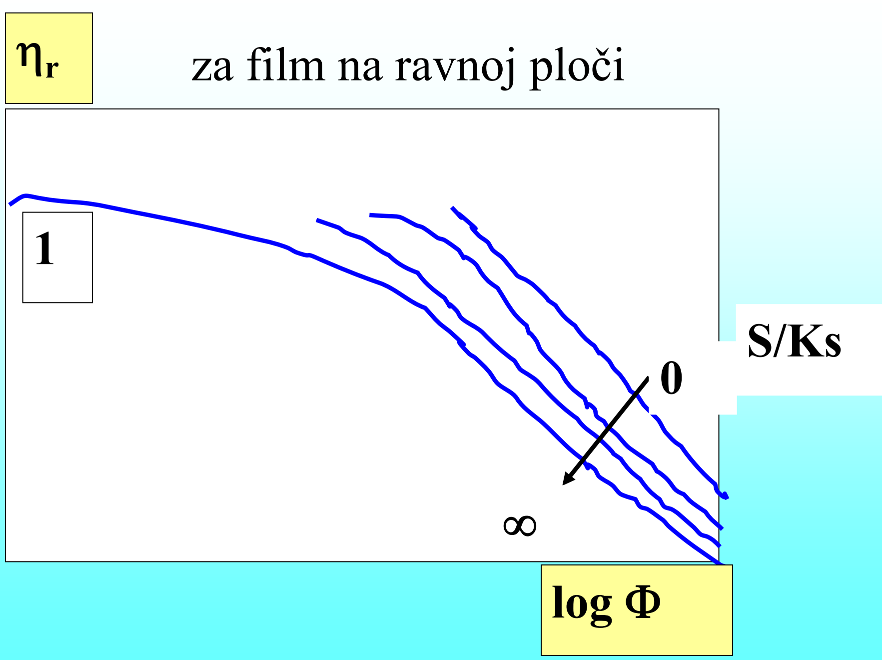
modificirani Thileov broj:

$$\Phi = \frac{d^2}{D_{eff}} * \frac{1}{S} * \frac{dS}{dt} = \Phi^2 * \eta_r \qquad \textbf{12-14}$$

$$v = v_{max} * \frac{S}{Ks+S} * X * \eta_r \qquad \textbf{12-15}$$

η_r = faktor efektivnosti (uspješnost, učinkovitost, djelotvornost)

za film na ravnoj ploči



NESTRUKTURIRANI MODEL RASTA PELETA

do sada su korištene ove jednadžbe:

-MICELARNI, FILAMENTOZNI RAST
(LINEARNI RAST NA VRHOVIMA, A EKSPONENCIJALNI U "GRANANJU")
-PELETNI RAST

- EKSPONENCIJALNI ZAKON
- MONOD-ova formula
- LOGISTIČKA JEDNADŽBA
- GOMPERTZ –ova jednadžba

$$\frac{dX}{dt} = k_1 * X * e^{(-k_2 * t)} \qquad 12\text{-}16$$

-JEDNADŽBA KUBNOG KORIJENA

$$X = \frac{N}{V} * \rho * \frac{4\pi}{3} * R^3 \qquad 12\text{-}17$$

$$\sqrt[3]{X_t} = \alpha * \sqrt[3]{X_o} * t \qquad 12\text{-}18$$

$$\sqrt[3]{X_t} = \sqrt[3]{X_o} + k * t \qquad 12\text{-}19$$

$$k = \mu * d^{\#}_{p} * \left(\sqrt[3]{\frac{\rho * N * 4\pi}{3}}\right)$$

$d^{\#}_{p}$ = debljina periferne zone peleta

$$\frac{dX}{dt} = 3 * \alpha_2 * d^{\#}_{p} * \mu * \sqrt[3]{X^2} \quad 12\text{-}20$$