Transporte de Masa

Reacciones sólido-fluido

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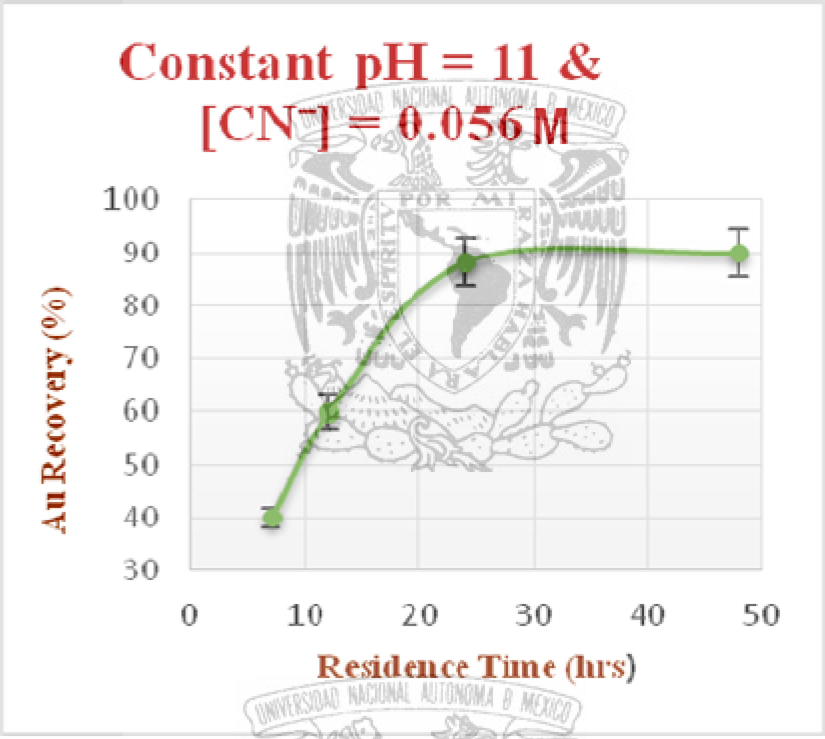
Semestre 2016-2

Evidencia experimental del avance de la reacción

$$4Au + 8CN^{-} + O_2 + H_2O \rightarrow 4Au(CN)_2^{-} + 4OH^{-}.$$



Avance de la reacción

Proceedings of the World Congress on Engineering 2014 Vol II,
WCE 2014, July 2 - 4, 2014, London, U.K.

Factors affecting Gold Recovery from Secondary Ore

Tatenda Chingosho, Oluwagbenga T. Johnson, *Member, IAENG,* and Melvin Mashingaidze

Evidencia experimental del avance de la reacción

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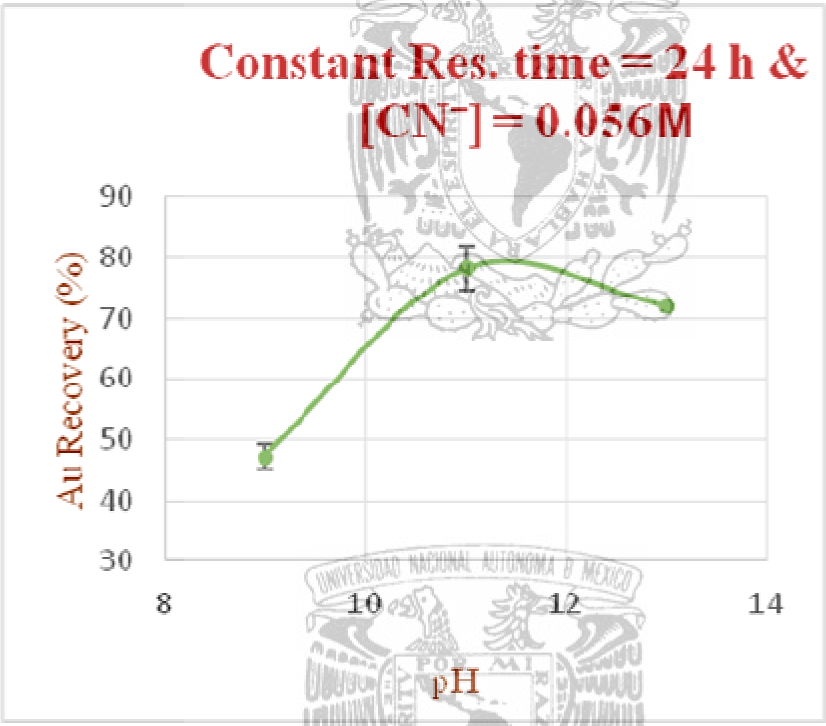

Efecto del pH

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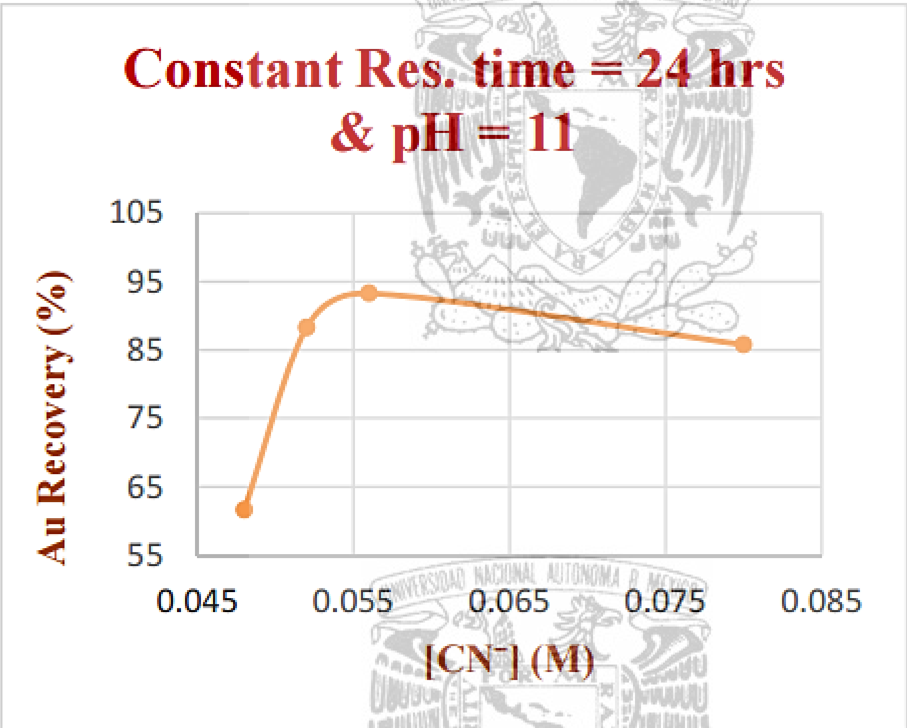

Efecto de la conc. de cianuro

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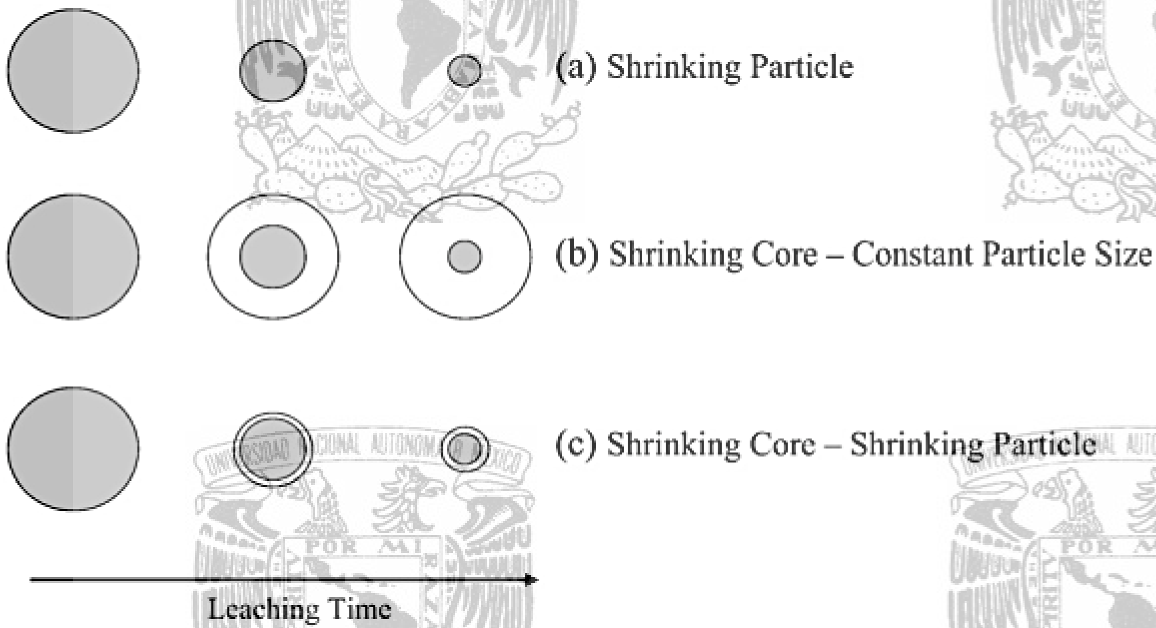
¿ Cómo avanza la oxidación de una manzana cortada ?

http://study.com/cimages/multimages/16/apple_browning.png

Modelos del avance de la reacción

Clasificación de los modelos y su representación esquemática:



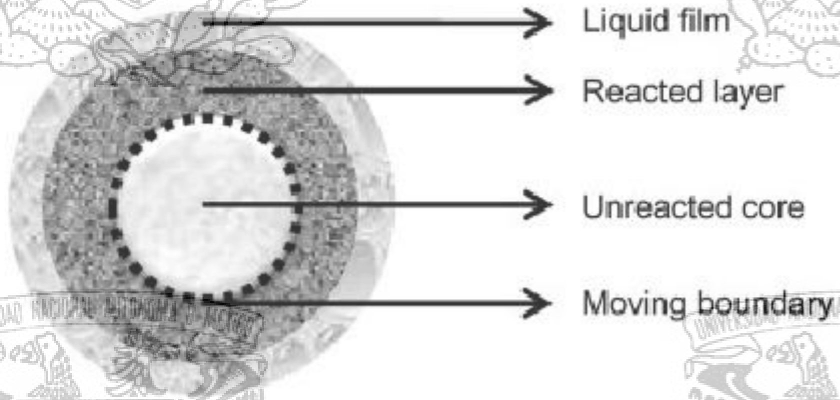
Int. J. Miner. Process. 93 (2009) 79–83
Contents lists available at ScienceDirect
Int. J. Miner. Process.
journal homepage: www.elsevier.com/locate/ijminpro
ELSEVIER

A shrinking particle—shrinking core model for leaching of a zinc ore containing silica

Vida Safari [a], Gilnaz Arzpeyma [a], Fereshteh Rashchi [b], Navid Mostoufi [a,*]

Modelos del avance de la reacción

$$4Au + 8CN^{-} + O_2 + H_2O \rightarrow 4Au(CN)_2^{-} + 4OH^{-}$$



Shrinking-core model

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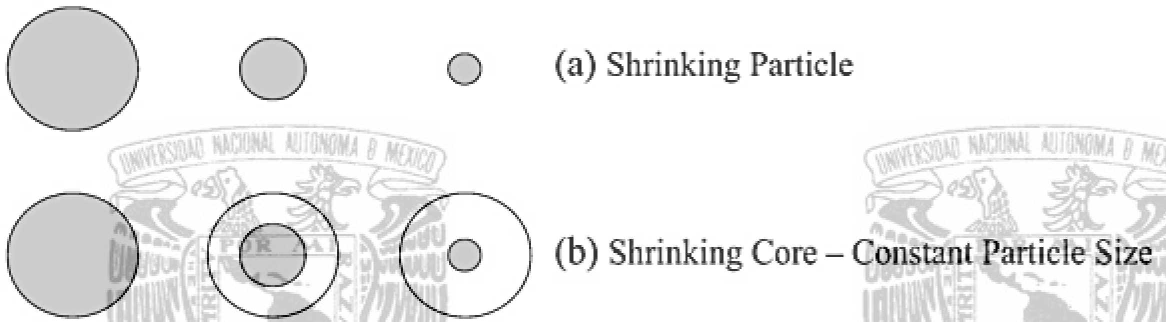
Modelos del avance de la reacción



O. Levenspeil desarrolló soluciones para diversas etapas controlantes en procesos gas-sólido. Estas soluciones se han aplicado a sistemas en hidrometalurgia, a pesar de que algunas suposiciones podrían no ser ciertas en ese caso.

En el archivo "Desarrollo de las ecuaciones de avance de la reacción" (ver AMYD) se presentan los pasos para obtener las soluciones de Levenspiel.

Modelos del avance de la reacción

Resumen de las soluciones para los casos “shrinking particle” y “shrinking core”

TABLE 4-4 **Rate Equations for Fluid-Solid Reactions**
(Unreacted-core model)
$aA(\text{fluid}) + bB(s) \rightarrow \text{products}$

Case	Controlling step	Rate equation
Fixed-size particles	Diffusion through gas film	$\frac{\theta}{\theta_1} = 1 - \left(\frac{r_c}{R}\right)^3 = x_B$ $\theta_1 = \frac{a\rho_B R}{3bk_m C_{A1}}$
	Diffusion through ash	$\frac{\theta}{\theta_2} = 1 - 3\left(\frac{r_c}{R}\right)^2 + 2\left(\frac{r_c}{R}\right)^3 = 1 - 3(1 - x_B)^{2/3} + 2(1 - x_B)$ $\theta_2 = \frac{a\rho_B R^2}{6bD_e C_{A1}}$
	Chemical reaction (nth order with respect to A)	$\frac{\theta}{\theta_3} = 1 - \frac{r_c}{R} = 1 - (1 - x_B)^{1/3}$ $\theta_3 = \frac{a\rho_B R}{bk_s C_{A1}^n}$

Modelos del avance de la reacción

Resumen de las soluciones para los casos “shrinking particle” y “shrinking core” (continuación)

Particle size varies; no ash formation	Diffusion through gas film*	For small particle (Stokes regime): $\frac{\theta}{\Theta} = 1 - (1 - x_B)^{2/3}$ $\Theta = \frac{\rho_B y R^2}{2bDC_{A1}}$ For large particle: $\frac{\theta}{\Theta} = 1 - (1 - x_B)^{1/2}$ $\Theta = KR^{3/2}/C_{A1}$
	Chemical reaction (ath order with respect to A)	$\frac{\theta}{\Theta_3} = 1 - \frac{r_c}{R}$ $= 1 - (1 - x_B)^{1/3}$ $\Theta_3 = \frac{a\rho_B R}{bk_s C_{A1}^a}$

Θ's are times required for complete conversion for individual controlling steps.

k_m and k_s are mass-transfer coefficient and reaction rate constant respectively, based on unit surface in m/s (ft/h) for k_m, and also for k_s when $a = 1$ (first-order reaction).

D_e is effective diffusivity of A in a porous structure in m^2/s (ft^2/h). C_{A1} is concentration of A in main fluid stream in mol/m^3 (mol/ft^3).

*Adapted from Ref. B-10; y is mole fraction of A in fluid, and K is a constant.