
*

(// // //)

:

[]

(COD) ^γ

() ^ε

[]

[]

γ

[]

ZSV

[]

ZSV

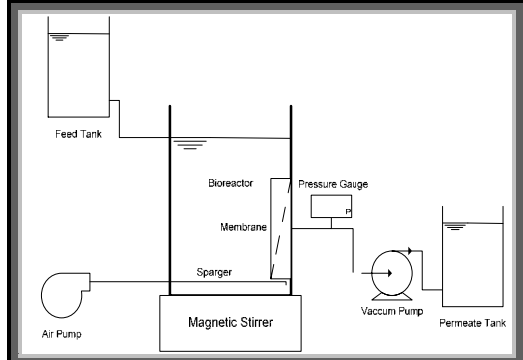
[]

[]

[]

[]

±%



()

()

/ meq/L

Mg Ca

[]

(SVI) ^

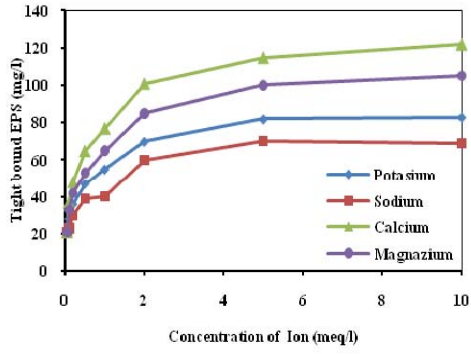
(ZSV) ^

SVI

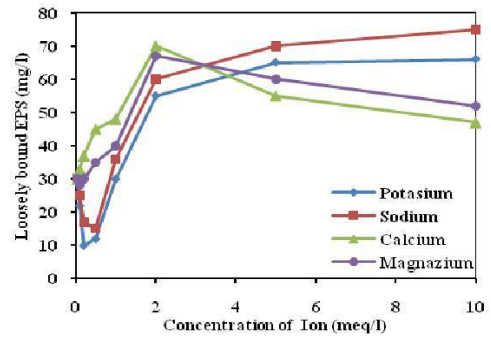
[]

() []

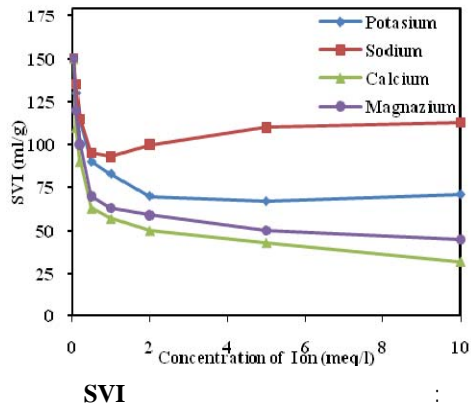
()



[]



SVI ()



[]

[]

()

()

meq/l

					(%)
/	/	/	/	/	(ZSV) (cm/s)
/	/	/	/	/	(l/(h×m ²))

[]

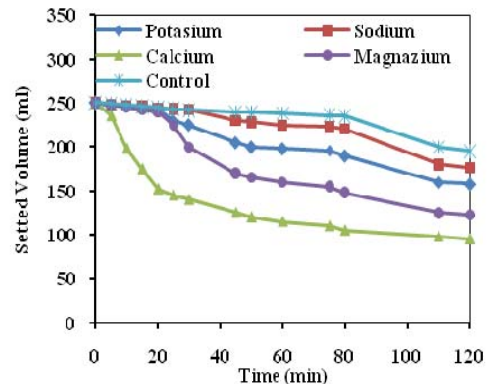
()

()

[]

meq/l

()



()

-
- 1- In-Soung, Ch. and Su-Na., K. (2004). "Wastewater treatment using membrane filtration—effect of biosolids concentration on cake resistance." *Process Biochemistry*, Vol. 40, PP. 1307–1314.
 - 2-Sanin, D. and Vsilind, P.A. (2000). "Bioflocculation of activated sludge: The role of calcium ions and extracellular polymers." *Environmental Technology*, Vol.21, PP. 1405-1412.
 - 3- Sombatsompop, K. (2007). Membrane fouling studies in suspended and attached growth membrane bioreactor systems PhD thesis, Asian Institute of Technology, School of Environment, Resources and Development, Thailand.
 - 4- Flemming, H.C. and Wingender, J. (2001). Relevance of microbial extracellular polymeric substances (EPSs). Part I. Structural and Ecological Aspects, *Water Science Technology*, Vol. 43, PP.1–8.
 - 5- Bruus, J.H., Nielsen, P.H. and Keiding, K., (1992). "On the stability of activated sludge flocs with implications on dewatering." *Water Research*, Vol. 26 , PP.1597-1604.
 - 6 –Urbain, V., Block, J.C. and Manem, J. (1993). "Bioflocculation in activated sludge: Analytical approach." *Water Research*, Vol.27 ,PP. 829-838.
 - 7 – Murthy, S. N. (1998). "Bioflocculation: Implications for activated sludge properties and wastewater treatment PhD thesis". Faculty of the Virginia Polytechnic Institute and State University, USA.
 - 8- Li, X.Y. and Yang, S.F. (2007). "Influence of loosely bound extracellular polymeric substances (EPS) on the Flocculation." Sedimentation and Dewaterability of Activated Sludge, *Water Research*, Vol. 41, PP. 1022 – 1030.
-

-
-
- 9- Arabi, S. and Nakhla, G. (2008). "Impact of calcium on the membrane fouling in membrane bioreactors." *Journal of Membrane Science*, Vol.314, PP. 134–142.
 - 10- Arabi, S. and Nakhla, G. (2009). Impact of magnesium on membrane fouling in membrane bioreactors." *Separation and Purification Technology*, Vol.67, PP. 319-325.
 - 11- Arabi, S. and Nakhla, G. (2009). Impact of cation concentrations on fouling in membrane bioreactors." *Journal of Membrane Science*, Vol. 343, PP.110–118.
 - 12- Liu, H., Herbert, H. and Fang, P. (2002), "Extraction of extracellular polymeric substances (EPS) of sludges." *Journal of Biotechnology*, Vol. 95, PP. 249–256.
 - 13- Gaudy, A.F. (1962). "Colorimetric determination of protein and carbohydrate." *Industrial Water Wastes*, Vol. 7, PP. 17–22.
 - 14- Bradford, M.M.A. (1976). "Rapid and sensitive method for the quantification of microgram quantities of protein utilizing the principle of protein dyebinding." *Analytical Biochemistry*, Vol.72, PP. 248–254.
 - 15- Jin, B., Wilén, B. M. and Lant, P. (2003). "A comprehensive insight into floc characteristics and their impact on compressibility and settleability of activated sludge." *Chemical Engineering Journal*, Vol. 95, PP. 221–234.
 - 16- APHA, Standard Methods for the Examination of Water and Wastewater, 20th ed., American Public Health Association, Baltimore, MD, 1999.
 - 17- Ji, J., Qiu, J., Wai, N., Wong, F. S., and Li, Y. (2010). "Influence of organic and inorganic flocculants on physical–chemical properties of biomass and membrane-fouling rate." *Water Research*, Vol.44, PP. 1627-1635.
 - 18- Ng, H. Y., Ong, S. L. and Ng, W. J. (2005). "Effects of sodium chloride on the performance of a sequencing batch reactor." *Journal of Environmental Engineering*, Vol. 131, PP. 1557-1564.
 - 19- Higgins, M. J., Sobock, D. C., Owens, S. J. and Szabo L. M. (2004). "Case study II: Application of the divalent cation bridging theory to improve biofloc properties and industrial activated sludge system performance using alternatives to sodium-based chemicals." *Water Environment Research*, Vol.76, PP. 353-359.
 - 20- Sheng, G. P., Yu, H. Q. and Li, X.Y. Extracellular polymeric substances (EPS) of microbial aggregates in biological wastewater treatment systems: A review, *Biotechnology Advances* in Press.
 - 21- Kim, I. S. and Jang, N. (2006). "The effect of calcium on the membrane biofouling in the membrane bioreactor (MBR)." *Water Research*, Vol. 40, PP. 2756 – 2764.
 - 22- Flemming, H.C., Schaule, G., Griebe, T., Schmitt, J. and Tamachkiarowa, A. (1997). "Biofouling-the achilles heel of membrane processes." *Desalination* Vol. 113, PP. 215–225.
 - 23- Wang, Z., Wu, Z. and Tang, S. (2009). "Extracellular polymeric substances (EPS) properties and their effects on membrane fouling in a submerged membrane bioreactor." *Water Research*, Vol. 43, PP. 2504-2512.
 - 24- Sobock, D. C., and Higgins, M. J. (2002). "Examination of three theories for mechanisms of cation-induced bioflocculation." *Water Research*, Vol. 36, PP. 527–538.
-

-
- 1- Total Suspended Solid
 - 2- Chemical Oxygen Demand
 - 3- Bioflocculating
 - 4- Extracellular Polymeric Substance (EPS)
 - 5- Anthrone
 - 6- Bovin Serume Albomin (BSA)
 - 7- Sludge Volume Index (SVI)
 - 8- Zone Sludge Velocity (ZSV)
 - 9- Algenic
-