Title: Electrophoretically deposited halloysite nanotubes coating as the adsorbent for the removal of methylene blue from aqueous solution

Authors: Morteza Farrokhi-Rad, Mehrdad Mohammadalipour, Taghi Shahrabi

PII: S0955-2219(18)30193-6
DOI: https://doi.org/10.1016/j.jeurceramsoc.2018.03.048
Reference: JECS 11805

To appear in: *Journal of the European Ceramic Society*

Received date: 12-12-2017
Revised date: 27-3-2018
Accepted date: 27-3-2018

Please cite this article as: Farrokhi-Rad M, Mohammadalipour M, Shahrabi T, Electrophoretically deposited halloysite nanotubes coating as the adsorbent for the removal of methylene blue from aqueous solution, *Journal of the European Ceramic Society* (2010), https://doi.org/10.1016/j.jeurceramsoc.2018.03.048

Electrophoretically deposited halloysite nanotubes coating as the adsorbent for the removal of methylene blue from aqueous solution

Morteza Farrokhi-Rad[a,1] , Mehrdad Mohammadalipour[b,1], Taghi Shahrabi[b *]

[a]Department of Materials Engineering, Faculty of Engineering, Azarbaijan Shahid Madani University, P.O.Box : 53751-71379, Tabriz, Iran

[b] Department of Materials Engineering, Faculty of Engineering, Tarbiat Modares University, P.O. Box 14115-143, Tehran, Iran

[*] Corresponding author. Tel.: +98 21 82883378, E-mail addresses: tshahrabi34@modares.ac.ir (T. Shahrabi).
[1]- These authors contributed equally to this work.

Abstract

Halloysite nanotubes (HNTs) coatings were prepared by electrophoretic deposition (EPD) from different alcoholic suspensions using polyethyleneimine (PEI) as the dispersant. The results of conductivity, zeta potential, FTIR and thermal analysis showed that PEI is protonated in alcoholic suspensions and then adsorbed on the surface of HNTs enhancing their zeta potential and so colloidal stability. Optimum concentration of PEI decreased with molecular size of alcohol due to the more adsorption of PEI on HNTs. Kinetics of EPD was the fastest from the suspensions with the highest zeta potential. HNTs coatings exhibited high resistance against cracking during their drying due to the self-reinforcement provided by long HNTs and the presence of PEI in their composition which acts as the binder. The coating (6cm^2) deposited from ethanolic suspension with 0.5g/l of PEI (optimum suspension) removed 36% of MB from its aqueous solution (concentration: 5mg/l and volume: 30ml) within 2h.

Keywords: Halloysite nanotubes (HNTs); Electrophoretic deposition (EPD); Methylene blue (MB); Polyethyleneimine (PEI); Adsorption.