Meetings International

Nano Res Appl 2017, 3:4
DOI: 10.21767/2471-9838-C1-006

INTERNATIONAL MEETING ON
ADVANCED NANOMATERIALS AND NANOTECHNOLOGY
NOVEMBER 07-08, 2017 SINGAPORE

Control of mesoporous silica nanoparticles physicochemical properties through control of synthetic parameter using Box-Behnken design

Mpho Phehello Ngoepe and Rui MW Krause
Rhodes University, South Africa

Statement of the Problem: Mesoporous silica nanoparticles (MSN) have been utilized in drug delivery due to their controllable release kinetics. The control of the physicochemical properties of nanoparticles for applications is stated to be complex despite the use of computational model. The pH, molar ratio of silica source and water and calcination temperature impact in drug delivery has not been studied before. Understanding of these critical synthetic parameters can aid in controlling the particle size, pore structure and size, surface chemistry and drug loading capacity.

Methodology & Theoretical Orientation: Box-Behnken design was utilized for evaluation of these parameters. Whereby, post-grafting of amine, surface chemistry post calcination, drug loading particle size and pore's structure was studied. For application in drug delivery, rifampicin was loaded into the particles followed by capping with pH responsive chitosan.

Findings: Based on the surface response plot from the experimental design, the size of the particle indicates to be dependent on the amount of water available for hydrolysis and dissolution to occur at a near neutral pH. The highest size obtained was 609±44.44 (n=3), whereby pH 8 and molar ratio of 126 was used. The smallest size was observed was observed at pH 12. The calcination temperature played a role in condensation of the free silanols which lead to changes in the grafting potential of the silica surface to (3-Aminopropyl) triethoxysilane. The amount of drug entrapped indicates can be improves though increase in particle size and increase in the porous particle structure.

Conclusion & Significance: This works adds to previous work that indicates that TEOS: water ratio plays a role in particle size, pH plays a role in the control of the network structure, whilst calcination temperature affects the degree of post synthesis silanol condensation.

mphongoepe@hotmail.com