The effect of surfactant extraction method on pore characteristics of mesoporous carbonated hydroxyapatite

Abstract

Incorporated with pore sizes of 2-50 nm, CHA was found to be a promising drug delivery agent for disease treatment and could be a carrier for different types of proteins. A desired drug delivery system should consist of an ordered pore network, optimum pore size, and volume, as well as a high surface area, to allow a high drug adsorption rate, controllable drug loading, and release. However, until now, most results are still not up to expectation; since the BET surface area and pore volume obtained has been rather low, compared to the existing mesoporous silica. The objective of this work was to investigate the effect of surfactant washing on the pore characteristics and the importance of this step in the synthesis process of mesoporous carbonated hydroxyapatite (CHA). In this study, mesostructured CHA particles were prepared, via a self-assembly mechanism, between CHA and non-ionic surfactant (P123), using the co-precipitation synthesis method. The synthesized mesoporous CHA samples were washed five times using different types of solvents for surfactant removal. A sphere-like particle shape of CHA was observed under SEM for all samples; regardless of the type of solvent used. The formation of CHA was confirmed by FTIR analysis, where the carbonate ion peaks were observed in the spectrums. It was found that the mesoporous CHA with a high surface area was synthesized when high polarity solvents were used during surfactant washing. These results imply that high surface area mesoporous CHA can be obtained through surfactant washing, without applying calcination for surfactant removal, which may change the structure of the CHA during heat treatment.