

Comparative study of the influence of several silica precursors on collagen self-assembly and of collagen on 'Si' speciation and condensation

[J. Mater. Chem.](#), 2006,16, 4220-4230

David Eglin,^{ab} Kirill L. Shafran,^b Jacques Livage,^a Thibaud Coradin and Carole C. Perry
Nottingham Trent University, Clifton Lane, Nottingham, United Kingdom

Abstract

In order to understand the possible interactions between silicon species and collagen, the effects of sodium silicate, molecular complexes of silicon and silica nanoparticles on the collagen self-assembly process have been extensively studied at a range of concentrations from ca. 8×10^{-5} to 1×10^{-2} M. The mode of interaction between collagen and 'silicon' appears species dependent. Depending on its concentration, silicate solutions either promote or hinder collagen fibrillogenesis. Low concentrations of a silicate solution promote fibril formation as does the addition of a silicon catecholato complex. The presence of silica nanoparticles and concentrated silicate solutions hinders fibril formation. The data obtained suggest that there may be direct interaction between the various 'Si' containing species and the collagen triple helices as initially formed. The effect of collagen self-assembly on 'silicon' speciation/condensation has also been investigated. These studies showed that collagen modifies the equilibrium distribution of molecular silicon species in solution, but to a much lesser extent than has been observed for other proteins extracted from biosilicifying organisms.

