Understanding the variation in FT-IR absorption signals as a function of PEG content in SiO_2 matrix synthesized via the sol-gel route

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Abstract.
The sol-gel route is a chemical technique useful for synthesizing hybrid materials applicable to several fields such as biomedical. Through the sol-gel method, it is possible to tailor the size and control the porosity, as well as, to obtain pure hybrid materials [1]. In this study, several inorganic-organic Silica/PEG (polyethylene glycol) hybrids have been synthesized through the sol-gel method, by using tetraethylortosilicate (TEOS) as the SiO_2 precursor. The PEG amount was 6, 12, 24 and 50 wt.% to SiO_2 stoichiometrically calculated. The inorganic phase is well-known in literature as bioactive, while the chosen organic phase is known to improve mechanical performance [2]. The influence of the organic phase has been investigated through the Fourier-transform infrared spectroscopy (FT-IR) in the range of 4000-400 cm^{-1}. A deconvolution study of the main Si-O-Si stretching vibration in the range 1600-800 cm^{-1} has also been carried out. According to the observation of FT-IR spectra, the changes in the shape of O-H stretching and banding, as well as the presence of CH_2 and CH_3 vibrations in Silica/PEG spectra revealed the co-presence of both phases. This finding is strengthened by the presence of C-O bending found in the deconvoluted spectra affecting the intensity and the shape of the Si-O-Si vibration band.

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