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A. Scano, F. Ebau, M.L. Manca, V. Cabras, F. Cesare Marincola, M. Manconi, M. Pilloni, A.M. Fadda, G. Ennas

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Novel Drug Delivery Systems for Natural Extracts: The Case Study of *Vitis Vinifera* Extract-SiO₂ Nanocomposites.

A. Scano^{a*}, F. Ebau^a, M. L. Manca^b, V. Cabras^a, F. Cesare Marincola^a, M. Manconi^b, M. Pilloni^a,
A. M. Fadda^b, G. Ennas^{a*}

^a Chemical and Geological Science Dept., University of Cagliari and Cagliari Research Unit of the National Consortium of Materials Science and Technology (INSTM), Cittadella Universitaria di Monserrato, 09042 Monserrato (CA), Italy

^b Life and Environment Science Dept., Section of Drug Sciences, CNBS, University of Cagliari, Via Ospedale 72, 09124 Cagliari, Italy

*Corresponding author

E-mail for correspondence: alescano80@tiscali.it, ennas@unica.it

Abstract

Ball Milling technique has been used to prepare for the first time *Vitis Vinifera* extract-silica nanocomposites (VV- SiO₂ NCs), which combine the pharmacological effects of the extract with the effectiveness of silica as drug delivery system and active component in the treatment of wound healing. Different contents (1.0, 9.0 and 33.0 wt%) of *Vitis Vinifera* ethanolic extract were loaded into the silica matrix by grinding the extract with fumed silica using a planetary mill apparatus. The effect of the starting mixture composition and milling time on the final products was examined. The efficiency of the milling process was studied by X-Ray Powder Diffraction, Nuclear Magnetic Resonance, and Infrared Spectroscopy, indicating that the natural extract was not affected by the increasing of the milling time. The successful loading of the extract was demonstrated by Nitrogen adsorption/desorption measurements, which showed a decrease in the SSA and pore volume of the silica with the increasing of the extract amount. Morphology of the nanocomposites, investigated by Scanning Electron Microscopy, showed an increased agglomeration in the nanocomposites with the increment of the VV extract amount. Studies on the total phenol quantification and antioxidant activity of the natural extract before and after incorporation in the silica matrix were also carried out. The obtained results indicate that the milling process does not alter the VV extract components, which result to be embedded in the silica matrix. An increase of the antioxidant activity with the

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