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Soft nanomaterials of POSS-based copolymer for stone arts conservation

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The conservation of stone arts is believed to eradicate or to retard the degradation processes arising from environmental factors, physical erosion and microorganisms. Nanoscience is a unique resource to conservation because the engineered nanomaterials do not alter the original physical and chemical properties of artefacts and have low environmental impact. Here, we report the soft nanomaterial (built from molecular blocks) in conserving historic stone arts. The molecular blocks bearing polyhedral oligomeric silsesquioxane (POSS) has unique nanoscale cage-shaped structure and a good solubility which could be easily incorporated into polymeric matrices with promising special properties. Therefore, several POSS-based soft nanomaterials are synthesized by atom transfer radical polymerization (ATRP) technique for stone conservation. (1) POSS-based epoxy copolymer of PGMA-g-P(MA-POSS), (2) the POSS-capped diblock copolymer of *ap*-POSS-PMMA$_m$-b-P(MA-POSS)$_n$, (3) the combination of linear PDMS and caged POSS triblock copolymer of PDMS-b-PMMA$_m$-b-P(MA-POSS)$_n$, and (4) tadpole-shaped POSS-based fluoropolymers of ap-POSS-PMMA-b-PDFHM. Their self-assembled nanopartiles in solution, the surface morphology, chemical composition, hydrophilic/hydrophobic properties, adhesive strength of films and thermal stability are characterized. The performance of these soft nanomaterials for the stone conservation is evaluated by the surface variation, pore size distribution, capillary water absorption, water contact angles and salt/freeze-thaw cycles. The obtained soft nanomaterials are prospected to have the great potential advantages in the conservation of historic stones.

Biography

Ling He is a Professor of Chemistry Department, University of Xian Jiaotong University. She is the Director of Chemistry Department and Director of Institute of Conservation for Cultural Heritage. She got her PhD in Chemistry Department of Northwestern Polytechnical University and MSc in Analytical Chemistry at University of Science and Technology of China. She has worked as Visiting Scholar in University of Munich University (Germany) in 1992-1994, and University of Bologna (Italy) in 1998-1999. She has published more than 60 papers in reputed journals and has been serving as an Editorial Board Member of repute.

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