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Layered materials and polydopamine nanoparticles as fillers for new bionanocomposites

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Hydrotalcites-like compounds (HTlc) (Figure 1a), also known as anionic clays or layered double hydroxides, represent the only example of lamellar solid with positively charged layers and exchangeable interlayer anions. HTlc properties can be suitably modulated by changing the nature and the composition of the metals, the type of interlayer anion, the amount of co-intercalated water and the size and morphology of the crystals.[1] HTlc based on MgAl and ZnAl are reported in different Pharmacopeias and are already used in medicine as antiacid and antipepsinic agents. Moreover, HTlc are considered excellent materials for designing drug delivery and tissue engineering materials/devices due to their biocompatibility, pH-dependent stability, ability to intercalate a wide variety of bio-molecular anions and their low toxicity.[2]

Polydopamine (PDA) is the most common type of synthetic melanin formed by the oxidative polymerization of the catecholamine dopamine in aqueous solution. In the last few years, it has attracted much interest in biomedical field due to its good biocompatibility, non-toxicity, biodegradability, photothermal and photoacoustic properties, ability to improve the adhesion of different cell types and to act as radical scavenger.[3] Thanks to all these features, PDA has also recently emerged as a promising bio-inspired material in the field of biocomposites, where the introduction of novel biocompatible, multifunctional and easy to prepare fillers is crucial.

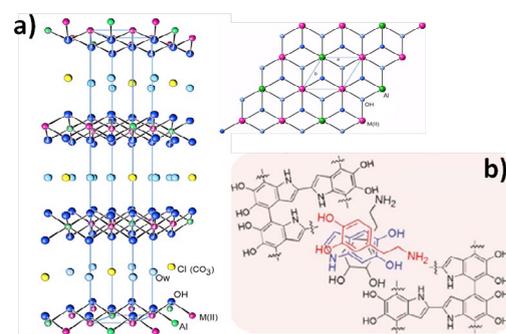


Fig. 1. a) Hydrotalcite structure; b) Polydopamine structure.

[1] V. Rives. Layered Double Hydroxides: Present and Future; Nova Science Publishers: New York, 2001.

[2] a) V. Rives, M. del Arco, C. Martín, Journal of Controlled Release, 2013, 169, 28; b) T. Posati, V. Benfenati, A. Sagnella, A. Pistone, M. Nocchetti, A. Donnadio, G. Ruani, R. Zamboni, M. Muccini, Biomacromolecules, 2014, 15, 158.

[3] Y. Li, K. Ai, L. Lu, Chem. Rev. 2014, 114, 5057.

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