

# Interaction of Betalain Pigments with Mg/Al Layered Double Hydroxides

Ryelle S. Abrenhosa<sup>1\*</sup>, Lucimar Pinheiro<sup>2</sup>, Renato Rosseto<sup>1</sup>

<sup>1</sup> *Campus Anápolis de Ciências Exatas e Tecnológicas, Universidade Estadual de Goiás, BR 153 Km 98, Anápolis, Goiás, 75132-903, Brazil.*

<sup>2</sup> *Centro Universitário de Anápolis, UniEvangélica, Av. Universitária, Km 3,5, Cidade Universitária, Anápolis, Goiás, 75070-290, Brazil.*

\*e-mail: [ryellesoares@hotmail.com](mailto:ryellesoares@hotmail.com)

Color is an important parameter for the quality control of foods, beverages and cosmetics, thus the pigmentation losses during processing and storage requires the use of colorants.<sup>1</sup> The consumer preference for natural pigments, as examples betalains and anthocyanins, over synthetic one is large, however the inherent low stability of natural pigments often limits their use.<sup>2</sup> Among various techniques to stabilize pigments, copigmentation, complex formation, and encapsulation are presented as promising methods.<sup>3</sup> Layered double hydroxides (LDHs), also known as anionic clays or hydrotalcite-like compounds, are materials containing flexible lamellar structures, feasible to adsorb and/or intercalate a large variety of species.<sup>4</sup> Many advantages can be obtained by incorporation of compounds into LDHs, such as the improvement of chemical, thermal and physical stability of active ingredients, and possibility of sustained release of intercalated compounds. In addition, the use of LDHs to encapsulate pigments in food or cosmetic chemistry is potentially interesting because of their high wettability, absence of odor and compatibility.<sup>4</sup> This work was focused on stabilization of betalain extract pigments on Mg/Al LDHs. Alcohol and water betalain extracts were obtained by heating red beet slices at 60 °C and further used without purification. The adsorption studies of betalain pigments on Mg/Al LDH were performed in batch experiments, varying parameters, such as contact time, pH, temperature, initial pigment extract volumes and LDH doses. Also, direct syntheses of LDHs over betalain extracts were performed, varying pH solution from 7 to 11. All LDH-betalains powders were characterized by infrared spectroscopy, X-ray diffraction, scanned electron microscopy and colorimetry. The results showed an efficient stabilization of betalain pigments on LDH when the direct synthesis was performed at pH close to 7, maintaining reddish to violet powder color. The pH stability of LDH-betalains was confirmed by dispersing the powder at room temperature in solutions with pH range from 5 to 9, which it was not observed significant color changes. The results open perspectives on the development of LDHs as coating to stabilize natural pigments, active ingredients, and so on. Details of the synthesis, characterization, adsorption and stability studies of the compounds will be presented.

1. Mortensen, A. *Pure Appl. Chem.* **2006**, 8, 1477-1491.
2. Rodriguez-Amaya, D. B. *Curr. Opin. Food Sci.* **2016**, 7, 20-26.
3. Khan, M. I. *Food Chem.* **2016**, 197, 1280-1285.
4. Wang, Q., O'Hare, D. *Chem. Rev.* **2012**, 112, 4124-4155.

The authors thank PrP/UEG and PrG/UEG (Pró-Eventos/UEG) and Programa de Bolsa de Incentivo à Pesquisa e Produção Científica (PROBIP/UEG) for sponsorships.