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Comparison of the nano-graphene oxide and a modified nano-graphene oxide@ almond shell in the remediation of Cd and Ni from the polluted aqueous solution

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The present study describes the preparation and capability of the low-cost graphene oxide/almond shell (GO@AS) composite by a freeze-drying method. The composite showed excellent ability to uptake the nickel and cadmium ions, which were characterized by FTIR and SEM techniques. The optimized values of pH, contact time and adsorbent doses were found to be 7.5, 1-3 h and 0.1 g, respectively. Also, adsorption isotherms of metal ions on adsorbents were determined and correlated with common isotherm equations such as, Langmuir and Freundlich models. The obtained correlation coefficient (R2) for different adsorbents (GO and GO@ AS composite) suggested well-fitting of the experimental data to Langmuir isotherm for Ni2+ and Cd2+ ions (except adsorption of Cd2+ ion on the surface of GO). The maximum sorption capacities of GO@AS calculated from Langmuir isotherm model were 113.63 mg g-1 for Cd (II) and 64.10 mg g-1 for Ni (II). Interestingly, it was found that much higher adsorption capacity was achieved for Cd (II) on GO@AS than that for Ni (II) adsorption.

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Employment of HPLC as an efficient tool for the determination of beclometasone dipropionate mixed micelles deposition into the skin

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The aim of this study was to determine the ability of polymeric micelles to successfully deposit into skin layers using HPLC. Polymeric micelles were prepared using Pluronic L-121 (25%) and Pluronic F-127 (75%). Entrapment efficiency, particle size, polydispersity index and zeta potential of the formula were 99.5±0.5%, 48.9±7.39 nm, 0.454±0.03 and _12.3±0.707 mV, respectively. The calibration curve of BDP was constructed using HPLC in 1:1 (v/v) mixture of ethanol: water and the detection wavelength was 254 nm. The mobile phase consisted of acetonitrile: water (70:30) delivered at flow rate of 1 ml/min. The assay validation was performed in terms of linearity, precision, specificity and accuracy. Ex vivo studies were performed using Franz-cell setup to compare skin deposition of beclometasone dipropionate (BDP) mixed micelles and the commercial product. At the end of the permeation experiment, the skin was demounted from the set up and washed with saline for 20 seconds to remove any residual drug. Then the skin was cut into small pieces and subjected to a thorough extraction for the efficient extraction of BDP from the skin. The solution was analyzed using HPLC to determine the amount of drug deposited into the skin. The local accumulation efficiency (LAC) values for BDP were calculated by dividing the amount of the drug deposited into the skin by the total amount permeated at the end of the experiment. The amount of BDP retained into the skin after six hours in case of the commercial formula was 204.42±37.92 ug/cm2, while that of mixed micelles was 632.52±15.59 ug/cm2. The calculated LAC ratio was found to be in case of mixed micelles 7.78. The LAC ratio was significantly higher than the brand formula having a LAC ratio of 0.33 (p<0.05). This confirms the enhancement of drug deposition accompanied by a decrease in the amount permeated into the systemic circulation in case of polymeric micelles These results revealed that, polymeric micelles could be a promising tool for enhanced delivery of poorly soluble drugs and that HPLC can be used as an efficient method for the determination of drugs deposited into the skin.

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