An Innovative Material for DNA Solid Extraction Application: Graphite oxide-cellulose Composites

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The extraction of DNA is the most crucial method used in molecular biology. It is the starting point for downstream processes and product development. Currently, there are many specialized method of extracting out pure DNA. Among these protocols, silica matrices are the most utilized one because of their unique properties for selective DNA binding. However, residual chaotrophic salt remains after purification and elution removes only 90–95% of the DNA from the surface of the silica matrices. Additionally they have high cost for laboratory research. In the light of these informations we focused on producing innovative material for DNA extraction applications. As with the majority of organic molecules, DNA also can be easily adsorbed on carbon-based materials. In the point of Graphite oxide (GO) sheets, have functional groups on the surface and can make pi-stacking interaction with DNA molecule makes it a good candidate for solid support. In this paper we prepared graphite oxide/cellulose beads as an advanced solid support material for the use of DNA extraction. GO/Cellulose beads were manufactured by dissolving Cellulose and GO with different concentration in NaOH–urea–water mixture. The beads are prepared by coagulation of dissolved GO/Cellulose solution in 2M nitric acid solution. The nano-structure analyses, characterization of samples are performed by SEM and FT-iR. DNA binding capacity, quantity and quality of DNA was measured by Qubit and Nano-drop devices. Different concentration of GO containing GO/Cellulose beads were successfully prepared and homogenous GO distribution observed on the surface of the beads. Binding capacity was measured by using different binding and elution buffers and results showed that capacity was increased proportionally as the GO concentration increase inside the beads. Binding capacity was compared with silica surfaces and GO/Cellulose beads show higher yield and extraction efficiency.