

Diagnosis of Hepatocellular Carcinoma by Detection of Alpha-fetoprotein (AFP) Using FRET  
between Carbon Dots and  
Graphene Oxide

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Hepatocellular Carcinoma(HCC) is often aware of symptoms after the cancer has advanced, so it needs early theranostics. Conventional methods using CT and MRI have problems like the risk of radiation exposure and side effects of contrast agents. In contrast, Carbon Dots(CDs) have attracted attention as biosensors because of their excellent biocompatibility, high electrochemical reaction and strong fluorescence properties. When HCC develops, serum Alpha-fetoprotein(AFP) level is elevated, so it can be used as a biomarker of HCC. Lens Culinaris Agglutinin(LCA), which specifically binds to AFP, is covalently conjugated to CDs to lead to CD-LCA composite. Graphene Oxide(GO) is a 2-dimensional nanomaterial having functional groups such as epoxy, hydroxyl and carboxyl groups and has an absorbance of 200–800nm. When CD-LCA is adsorbed on the GO surface by a  $\pi$ - $\pi$  stacking interaction, Fluorescence quenching occurs due to the FRET phenomenon between CDs with emission at 550nm and the GO. Owing to the binding between AFP and LCA, CDs are detached from surface of GO and fluorescence recovery occurs. Thus, the developed CD-LCA can be applied to the HCC diagnosis safely and easily.