Abstract

During the cancer process of human cells, various morphological and genetic changes occur in the cell, and certain proteins may be more pronounced in different parts of the cell. The outer surface of the cell membrane is the site of expression of proteins that are of particular importance because of the free access of antibodies, and these biomaterials are known as biomarkers. An antibody can easily detect its own biomarker, but it cannot automatically generate a signal (electrical, chemical, electrochemical, optical, thermal, etc.) to track and measure. By connecting an antibody with signal-producing materials such as magnetic nanoparticles and quantum dot, which have good stability and produce a stable signal with an external stimulus, a reliable diagnostic probe can be obtained.

In this project, the magnetic nanoparticles were first synthesized by the hydrothermal method and a thin silicate coating containing quantum dot nanoparticles was created around it. This coating makes it possible to bind biomolecules, especially monoclonal trastuzumab antibodies. These nanoparticles are designed in such a way that in the presence of HER2 antigen, they have the ability to bind to this biomarker and after connecting the optical and magnetic properties of nanoparticles, it is possible to identify these nanoparticles. After preparing fluorescent magnetic nanoparticles attached to the trastuzumab antibody, the properties of the particle surface and their absorption and emission spectra and their magnetic strength were studied, and finally their binding and signaling strength in the presence of antigen was investigated.