

عنوان مقاله:

Decrease of catalytic efficiency of Photinus pyralis firefly luciferase in the presence of graphene quantum dots

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خلاصه مقاله:

Objective(s): Firefly luciferase is a monooxygenase enzyme that emits flash of light during the enzymatic reaction. Luciferase has been used in many bioanalytical fields from ATP detection methods to in vivo imaging. In recent decades, focus has been carried out on nanoparticles for their fluorescence properties. Semiconductor quantum dots have unique tunable properties that turn them promising tools in biological and biomedical researches, as nanosensors, photo-electrochemical and light-emitting devices. Carbon-based nanoparticles such as graphene quantum dots (GQDs) have useful benefits such as low toxicity, suitable luminescence and easy preparation. **Materials and Methods:** In this study, recombinant *P. pyralis* luciferase was expressed and purified based on N-terminal His-tag and then kinetic parameters of enzyme activity such as K_m and V_{max} values in presence and absence of GQDs were calculated. **Results:** The results showed that K_m for ATP and luciferin substrates in the presence of GQDs were increased. Fluorescence spectroscopy showed significant changes in protein structure or in fluorescence spectra and decrease in the activity of the luciferase in presence of GQD. Both loss of activity and increase of substrates K_m showed decrease of catalytic efficiency presumably through structural alteration. **Conclusion:** From these data it can be concluded that the protein structure under the influence of GQD may have .changed that lead to alteration of enzyme activity

کلمات کلیدی:

Bioluminescence, Graphene, Luciferase, Quantum dot

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