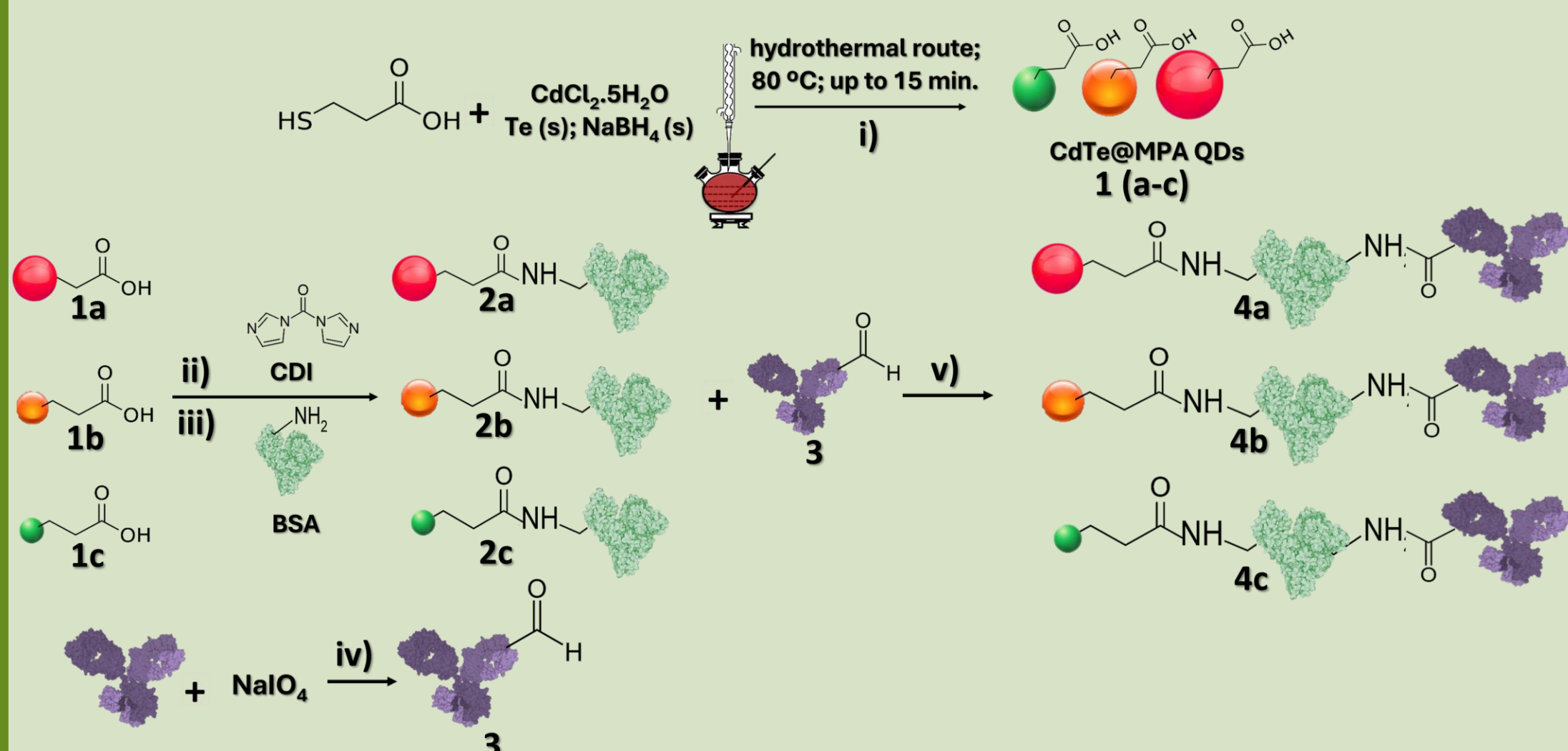


INTRODUCTION

Cancer is a global health challenge, where early detection is crucial to increasing survival rates [1]. Non-invasive, rapid, and affordable diagnostic methods are urgently needed. Immunosensors emerge as promising alternatives to traditional methods such as ELISA, allowing point-of-care (PoC) analyses [2]. This study introduces a fluorescent probe using cadmium telluride quantum dots (CdTe@MPA QDs) to detect the pancreatic cancer biomarker CA 19-9. With the increasing CA 19-9 concentrations, the fluorescence intensity of green-, orange-, and red-emitting QDs@conjugates was reduced, creating a visible colour gradient under a 365 nm UV lamp. The method, suitable for serum analysis, is highly sensitive and selective, with a detection range of 0.31 to 501.9 U mL⁻¹ and analyzed using ImageJ software. These immunosensors offer significant potential for cancer biomarker detection in clinical diagnostics.

METHODOLOGY



Schematic of the synthesis of bioconjugates **4 (a-c)**: Hydrothermal synthesis of green, orange, and red-emitting CdTe@MPA QDs **1 (a-c)** (i); activation of QDs with CDI (ii); conjugation with BSA to form BSA@QDs **2 (a-c)** (iii); activation of antibodies with sodium periodate (iv); final conjugation to form bioconjugates **4 (a-c)**.

GENERAL CONSIDERATIONS

- The immunosensor developed showed good analytical performance.
- Linear response range of the immunosensor: 0.31 to 501.9 U mL⁻¹.
- Effective tool for screening cancer biomarkers in PoC tests.

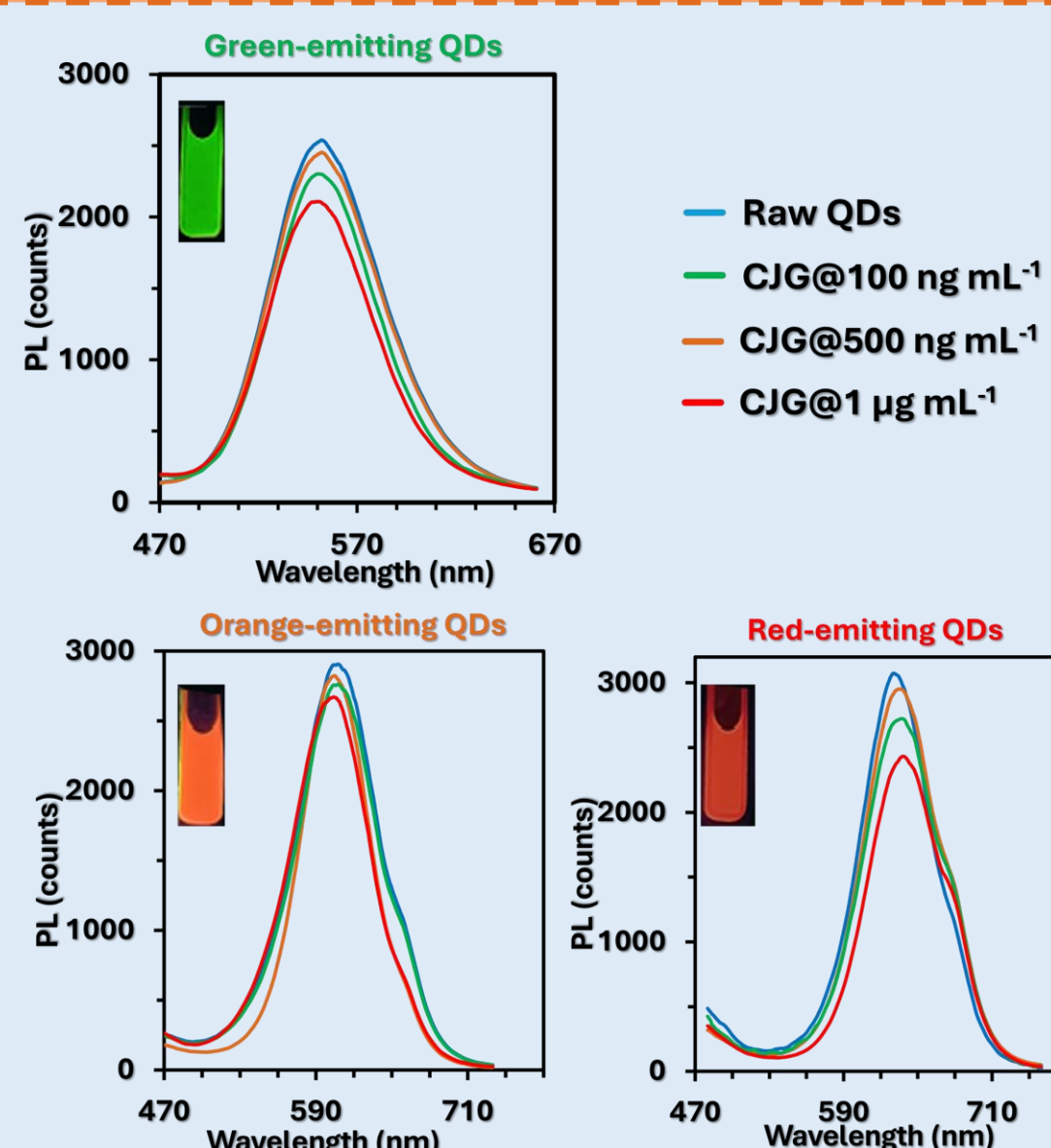
REFERENCES

- [1]. Griffin, S., 2017, S&T's Peer to Peer: Vol.1, Iss.2.
[2]. Sarhadi, V. K., Armengol, G., 2022, Biomolecules, 12 (8), 1021.

The authors thank FCT, I.P., for funding the project "Following up cancer biomarkers with new biomimetic optical systems" (<https://doi.org/10.54499/2022.07897.PTDC>), and acknowledge partial support from the Portuguese Foundation for Science and Technology (FCT) through grants UIDB/04730/2020 and UIDP/04730/2020.

RESULTS

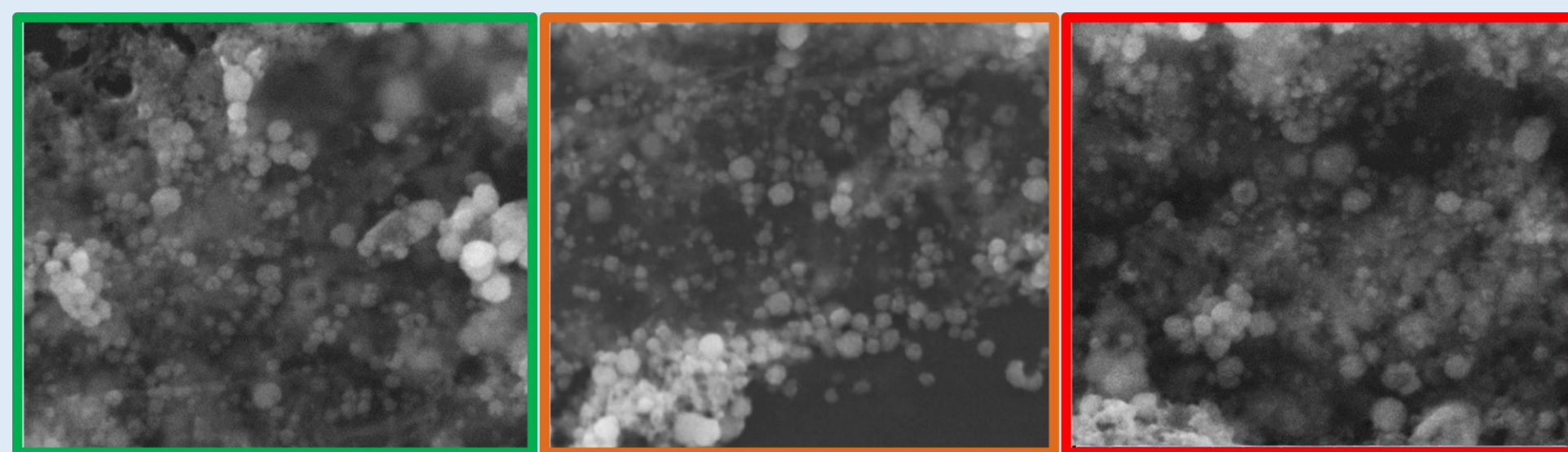
Fluorescence assembly of the immunosensor



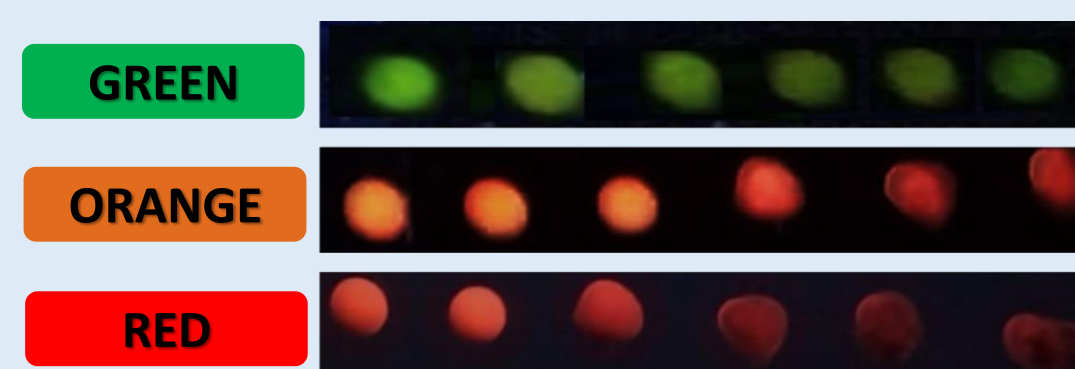
- Emission spectra of the immunosensor of green-, orange- and red-emitting were measured at 355 PMT voltage and 360 nm excitation.

Surface characterization of the immunosensor

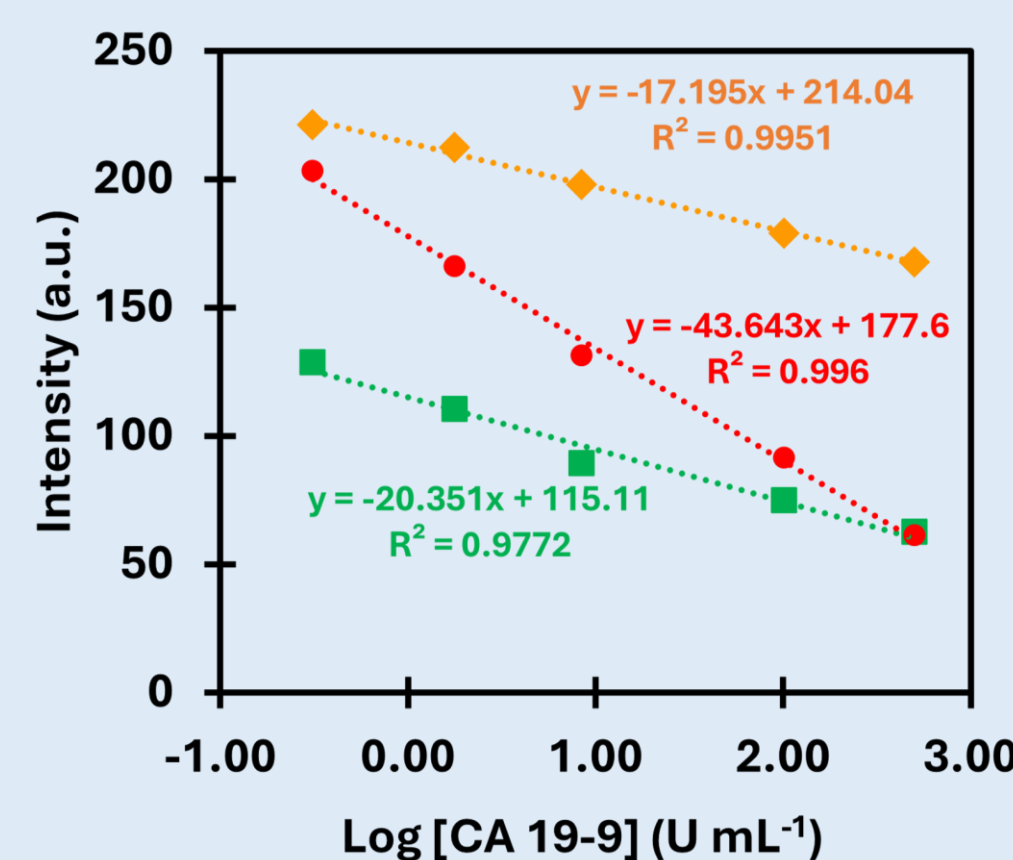
- SEM image of green-, orange- and red-emitting immunosensor bioconjugates.



Analytical performance of the immunosensor



Photographs of the fluorescence sensor showing colour change in the presence of CA 19-9.



- Good response over the concentration range of 0.31 – 501.9 U mL⁻¹.
- Higher sensitivity.
- Improved linearity.