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Label-free quantum dot conjugates for human protein IL-2 based on molecularly imprinted polymer

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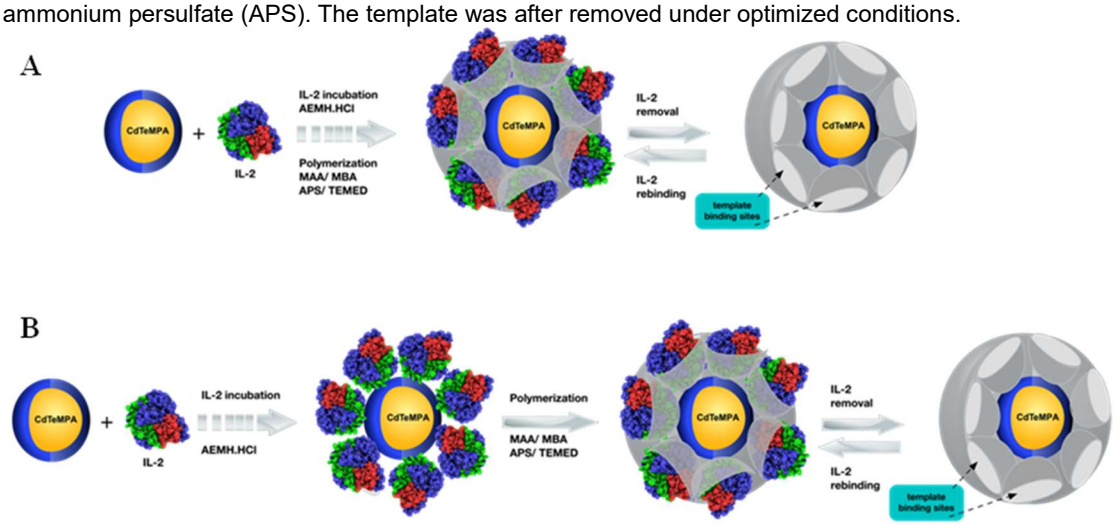
The development of a fluorescent-based sensor by combining quantum dots (QDs) with molecularly-imprinted technology (MIP), intensively optimized to generate exceptional operating features is presented. This sensor is designed to target human interleukin-2 (IL-2) in synthetic human serum. IL-2 is a regulatory protein released as a triggered response from the immune system towards an inflammation[1].
For this purpose, cadmium telluride (CdTe) QDs are prepared with 3-mercaptopropionic acid (MPA) and modified afterwards to produce an IL-2 imprinted polymer. This was made by first incubating IL-2 in PBS with aminoethyl methacrylate hydrochloride (AEMH), and polymerizing after with methacrylic acid (MAA) and *N,N´*-methylenebis(acrylamide) (MBA), upon initiation with tetramethylethylenediamine (TEMED) and ammonium persulfate (APS). The template was after removed under optimized conditions.



Scheme 1: (**A**) Bulk imprinting strategy for the preparation of the conjugated-QDs; (**B**) Surface imprinting strategy for the preparation of the conjugated-QDs.

During IL-2 rebinding, the fluorescence intensity of CdTe-MPA QDs is quenched in a concentration dependent manner (Scheme 1). Optimal fluorescence signals yielded a linear response versus logarithm of IL-2 concentration from 35 fg/mL to 39 pg/mL, in a 1000-fold diluted synthetic human serum. The limit of detection obtained is 5.91 fg/mL, lying below the concentration levels of clinical interest[2].
Overall, the method presented herein is a demonstration that the combination of MIP and QDs for protein detection constitutes a powerful tool in clinical analysis, providing low cost, sensitive and quick responses. The same concept may be further extended to other proteins of interest.

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References:

1. Menssen, H. D.; Harnack, U.; Erben, U.; Neri, D.; Hirsch, B.; Durkop, H. *Journal of Cancer Research and Clinical Oncology* **2018,** *144*, 499.
2. Ross, A. E.; Pompano, R. R. *Analytica Chimica Acta* **2018,** *1000*, 205.