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(54) **Title:** VISUAL AND MODULAR DETECTION OF NUCLEIC ACIDS WITH ENZYME-ASSISTED NANOTECHNOLOGY

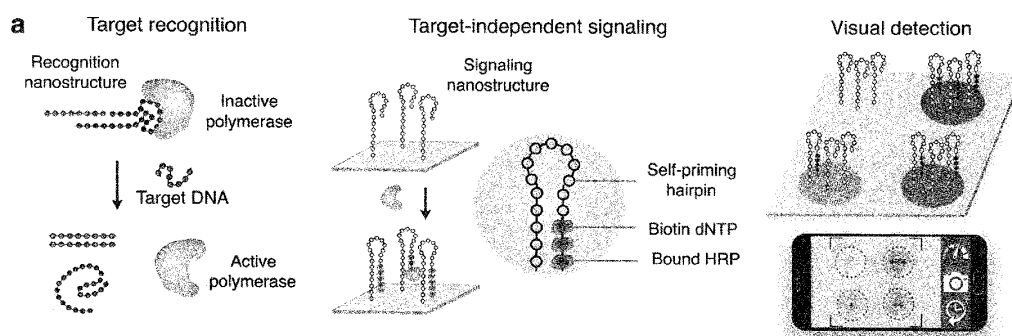


Figure 1

(57) **Abstract:** The present invention provides methods and devices for specific detection of nucleic acids using an integrated circuit of two independent enzyme-DNA nanostructures - an easily adjustable recognition element and a sensitive universal signaling element - to decouple target recognition and visual signal amplification. The recognition element comprises a DNA polymerase enzyme, a DNA polymerase enzyme-specific DNA aptamer and an inverter oligonucleotide. In the presence of a target nucleic acid, the inverter oligonucleotide binds to the target nucleic acid and releases the DNA polymerase enzyme from inhibition by the DNA aptamer. The activated DNA polymerase enzyme is then contacted with a signaling nanostructure comprising a self-priming portion responsive to the DNA polymerase enzyme, in the presence of labelled dNTPs and signal development reagents, wherein the activated DNA polymerase enzyme would add the labelled dNTPs to the self-priming portion, followed by the binding of the signal development reagents to the labelled dNTPs.

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