

## Title: Dual-Sensitive Polymeric Nanoparticles for Real-time Visualization of Tumor Hallmarks

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**KEYWORDS:** pH, Matrix metalloproteinase (MMPs), Carbon dots, Real-time visualization, Tumor

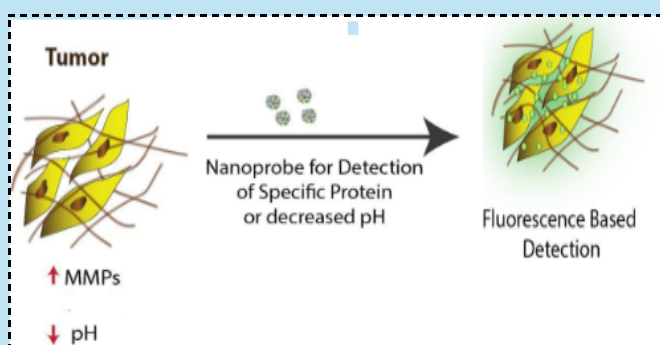
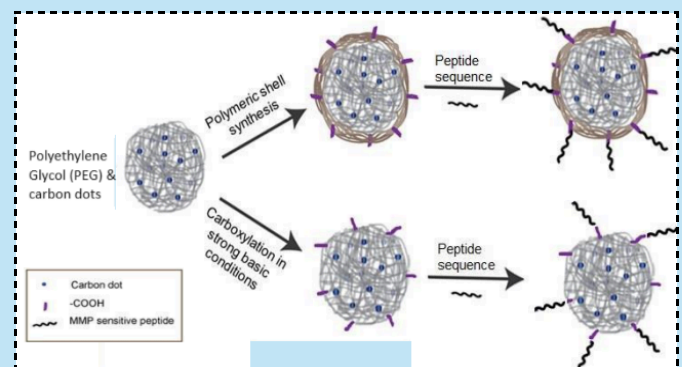
**DOMAIN:** Life Science (Nanotechnology)

### SUMMARY:

The dual-sensitive polymeric nanoparticle is a contrast-producing label for detecting and visualizing the malignant tumor boundary. The nanoparticle can detect two of the well-known hallmarks found in the tumor-specific regions i.e., a decrease in pH and increase in matrix metalloproteinases (MMP). The nanoparticles respond to these changes and generate fluorescence around the tumor cells, enabling real-time visualization. The ability to accurately differentiate the target tumor from normal cells, thereby applying the same in resection margin analysis, promotes the removal of tumor margins to prevent any tumor recurrence.

### The preparation process of the dual sensitivity of the nanoparticle

The surface modification of the nanoparticles with specific nanoprobe resulted in the dual sensitivity of the nanoparticles. To introduce the dual functionality of the nanoparticle, the polyethylene glycol (PEG) coated carbon dots are assembled with MMPs sensitive peptide and polymer nanoprobe.



### The mechanism of the Dual-sensitive polymeric nanoparticle functionality

The nanoparticles interact with MMP proteins and sense pH changes to generate high-intensity red and blue fluorescence respectively. The intensity of the fluorescence measured from fluorometric analyses lies in the range of pH: 365nm and MMP proteins: 530 nm.

### ADVANTAGES:

1. The nanoparticles are biodegradable and non-toxic.
2. Dual-sensitivity to both pH and concentration of matrix metalloproteinases (MMP).

3. Real-time information on the tumor for margin clearance and treatment.

**APPLICATION:** Malignant tissue examination and diagnosis.

**SCALE OF DEVELOPMENT:** The dual-sensitive nanoparticle is developed and in-vitro analysis is performed at a lab scale.

**TECHNOLOGY READINESS LEVEL:** TRL 4

**IP STATUS:** Indian Patent Application No. (202111048499)