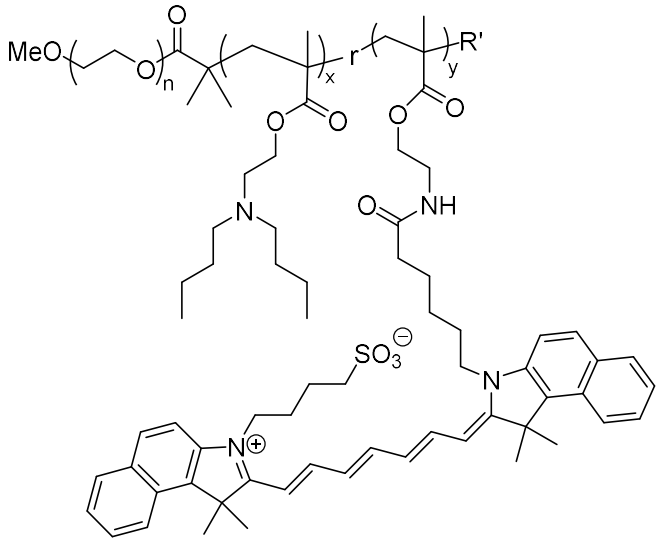
CLAIMS

WHAT IS CLAIMED IS:

1. A pH responsive composition comprising a block copolymer of Formula (I), or a pharmaceutically acceptable salt, solvate, hydrate, or isotopic variant thereof:



(I),

wherein:

n is 113;

x is 60-150;

y is 0.5-1.5;

R’ is a halogen, -COH, or –C(O)OH; and

wherein the pH responsive composition has a pH transition point between 4.8 to 5.5.

2. The pH responsive composition of claim 1 comprising a micelle comprising of one or more block copolymers of Formula I.
3. The pH responsive composition of claim 2 further comprising an emission spectrum.
4. The pH responsive composition of claim 1, wherein the pH transition point is about 4.8, 4.9, 5.0, 5.1, 5.2, 5.3, 5.4, or 5.5.
5. The pH responsive composition according to any one of claims 3-4, wherein the emission spectrum is between 700-850 nm.
6. The pH responsive composition according to any one of claims 1-5, wherein the composition has a pH transition range ($\Delta pH_{10\text{-}90\%}$) of less than 1 pH unit.
7. The pH responsive composition of claim 6, wherein the pH transition range is less than 0.25 pH units.

8. The pH responsive composition of claim 6, wherein the pH transition range is less than 0.15 pH units.
9. The pH responsive composition according to any one of claims 1-8, wherein the pH responsive composition has a fluorescence activation ratio of greater than 25.
10. The pH responsive composition according to any one of claims 1-9, wherein the pH responsive composition has a fluorescence activation ratio of greater than 50.
11. The pH responsive composition according to any one of claims 1-10, wherein the pH responsive composition has a mean contrast ratio of greater than 50.
12. An imaging agent comprising one or more pH responsive compositions of any one of claims 1-11.
13. The imaging agent of claim 12 comprising poly(ethyleneoxide)-*b*-poly(dibutylaminoethyl methacrylate) copolymer indocyanine green conjugate.
14. A method of imaging the pH of an intracellular or extracellular environment comprising:

(a) contacting a pH responsive composition of any one of claims 1-11 with the environment; and

(b) detecting one or more optical signals from the environment, wherein the detection of the optical signal indicates that the micelle has reached its pH transition point and disassociated.

15. The method of claim 14, wherein the optical signal is a fluorescent signal.
16. The method of claim 14 or 15, wherein when the intracellular environment is imaged, the cell is contacted with the pH responsive composition under conditions suitable to cause uptake of the pH responsive composition.
17. The method of any one of claims 14-16, wherein the intracellular environment is part of a cell.
18. The method of any one of claims 14-16, wherein the extracellular environment is of a tumor or vascular cell.
19. The method of claim 18, wherein the extracellular environment is intravascular or extravascular.
20. The method of claim 18, wherein the tumor is of a cancer.
21. The method of claim 20, wherein the cancer is breast cancer, head and neck squamous cell carcinoma (NHSCC), lung cancer, ovarian cancer, prostate cancer, bladder cancer, urethral cancer, esophageal cancer, colorectal cancer, brain cancer, or skin cancer.

22. The method of any one of claims 18 - 21, wherein the tumor is a metastatic tumor cell.

23. The method of claim 22, wherein the metastatic tumor cell is located in a lymph node.