

Listing of the Claims:

1. A method of treating a water system, the method comprising:
providing to the water system a fluorescent-tagged treatment polymer that is the reaction product of a mixture that includes at least one unsaturated monomer, at least one initiator with at least one reactive terminal group for reacting with the unsaturated monomer, and at least one fluorescent chain transfer agent, the at least one fluorescent chain transfer agent having a phosphorus-hydrogen or sulfur-hydrogen group connected to a polyaromatic hydrocarbon group having from two to ten rings, and the at least one fluorescent chain transfer agent being a chain transfer agent that controls final polymer molecular weight of the fluorescent-tagged treatment polymer and a fluorescent tag for the fluorescent-tagged treatment polymer.
2. The method of claim 1, wherein the one or more fluorescent chain transfer agent is a phosphinic or a thiol based compound.
3. The method of claim 1 or claim 2, wherein the polyaromatic hydrocarbon group has two to five rings.
4. The method of any one of claims 1 to 3, wherein at least one of the one or more unsaturated monomer is a monoethylenically unsaturated monomer further having one to five carbonyl groups.
5. The method of any one of claims 1 to 4, wherein the fluorescent-tagged treatment polymer is provided in an amount from 0.1 ppm to 100 ppm per liter of water in the water system.
6. The method of any one of claims 1 to 5, further comprising preparing the fluorescent-tagged treatment polymer in a reactor by feeding the one or more monomer, the one or more initiator, and the one or more fluorescent chain transfer agent to the reactor.
7. The method of any one of claims 1 to 6, further comprising using a fluorimeter to detect a fluorescence signal of the fluorescent-tagged treatment polymer.

8. The method of claim 7, further comprising:
correlating the fluorescence signal from the fluorimeter to a concentration of the fluorescent-tagged treatment polymer in the water system; and
adding an additional amount of the fluorescent-tagged treatment polymer to the water system to adjust the concentration of the fluorescent-tagged treatment polymer in the water system.