[0004] Although biological contamination is a recognizable concern in the food and drug industry, the problem of contamination by bacteria and other microorganisms extends to a much broader array of fields, including those not directly impacting human health. For example, and without limitation, biological monitoring of water treatment and wastewater processing streams, including those from refineries, can be of significant interest due to downstream contamination issues. In subterranean oil and gas operations, biological contamination can reduce production and/or result in biofouling of equipment and wellbore surfaces. In addition, biological contamination on some solid surfaces can lead to structural defects, including corrosion, that ultimately may result in mechanical failure. In short, any industry in which monitoring of biological contamination or concentration is of interest could potentially benefit from more rapid detection techniques for biological materials.

[0005] While monitoring for the presence of biological materials, there is often also an interest in reducing or otherwise preventing biological contamination within a substance, such as a fluid. In some instances, a biocide may be used to slow or stop biological growth. Although biocides may often be effective for addressing the particular biological contamination, their effects can sometimes be slow acting. In addition, at least some members of a population of microorganisms are able to survive various biocide treatments.

SUMMARY ~~OF THE INVENTION~~

[0006] The present ~~invention~~ disclosure relates to methods for monitoring a fluid in or near real-time and, more specifically, to methods for monitoring a fluid for the purpose of identifying microbiological content and/or microorganisms therein and to determine the effectiveness of a microbiological treatment.

[0007] In at least one ~~aspect~~ embodiment of the disclosure, a system is disclosed and includes a flow path containing a fluid having at least one microorganism present therein, at least one integrated computational element configured to optically interact with the fluid and thereby generate optically interacted light, and at least one detector arranged to receive the optically interacted light and generate an output signal corresponding to a characteristic of the fluid, the characteristic of the fluid being indicative of a concentration of the at least one microorganism within the fluid. In one aspect, there is provided

a system, comprising: a flow path containing a fluid; at least one integrated computational element configured to optically interact with the fluid and at least one microorganism therein, thereby generating optically interacted light; and at least one detector arranged to receive the optically interacted light and generate an output signal corresponding to a characteristic of the fluid, the characteristic of the fluid comprising a property relating to the at least one microorganism.

[0008] In other ~~aspects~~ embodiments of the disclosure, a method of monitoring a fluid is disclosed. The method may include containing the fluid within a flow path, the fluid including at least one microorganism present therein, optically interacting electromagnetic radiation from the fluid with at least one integrated computational element, thereby generating optically interacted light, receiving with at least one detector the optically interacted light, and generating with the at least one detector an output signal corresponding to a characteristic of the fluid, the characteristic of the fluid being a concentration of the at least one microorganism within the fluid. In another aspect, there is provided a method of monitoring a fluid, comprising: containing the fluid within a flow path; optically interacting at least one integrated computational element with the fluid and at least one microorganism present within the fluid, thereby generating optically interacted light; receiving with at least one detector the optically interacted light; and generating with the at least one detector an output signal corresponding to a characteristic of the fluid, the characteristic of the fluid being a property relating to the at least one microorganism within the fluid.

[0009] In yet other ~~aspects~~ embodiments of the disclosure, a quality control method for a fluid is disclosed. The method may include optically interacting an electromagnetic radiation source with a fluid contained within a flow path and at least one integrated computational element, thereby generating optically interacted light, the fluid having at least one microorganism present therein, receiving with at least one detector the optically interacted light, measuring a characteristic of the fluid with the at least one detector, the characteristic of the fluid being a concentration of the at least one microorganism present therein, generating an output signal corresponding to the characteristic of the fluid, and undertaking at least one corrective step when the characteristic of the fluid surpasses a predetermined range of suitable operation. In yet another aspect, there is provided a quality control method for a fluid, comprising: optically interacting at least one integrated computational element with a fluid contained within a flow path and thereby generating optically interacted light, the fluid having at least one microorganism present therein; receiving with at least one detector the optically interacted light; measuring a characteristic of the fluid with the at least one detector, the characteristic of the fluid being a property relating to the at least one microorganism; generating an output signal corresponding to the characteristic of the fluid; and undertaking at

least one corrective step when the characteristic of the fluid surpasses a predetermined range of suitable operation.

[0010] The features and advantages of the present ~~invention~~ disclosure will be readily apparent to one having ordinary skill in the art upon a reading of the description of the preferred embodiments that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The following figure is included to illustrate certain aspects of the present invention, and should not be viewed as an exclusive embodiment. The subject matter disclosed is capable of considerable modification, alteration, and equivalents in form and function, as will occur to one having ordinary skill in the art and the benefit of this disclosure.

[0012] FIG. 1 illustrates an exemplary integrated computation element, according to one or more embodiments.

[0013] FIG. 2 illustrates a block diagram non-mechanistically illustrating how an optical computing device distinguishes electromagnetic radiation related