susceptible to contamination from food particles entering the small conductor spacing. Further, known electrodes, such as those described above, do not comply with food safety regulations.

SUMMARY OF THE INVENTION

[0007] Therefore, a need has arisen for systems and methods for a cooking apparatus that may overcome these and other shortcomings of the related art. A technical advantage according to embodiments of the present invention is that an electrode unit may be~~is~~ created that complies with food safety regulations, and may be~~is~~ durable enough for use in a commercial fryer. Moreover, the size and geometry of the electrode determine the magnitude of the output response. As mentioned above, most cooking media have a very high resistance. The electrode current then is very small, e.g., on the order of micro-amps (μA) or nano-amps (nA). Thus, a large circuit gain is beneficial to create a usable signal. Nevertheless, artificially boosted circuit gains also amplify the system noise. This increases the need for signal filtering and processing, and also may contribute to false readings. Thus, embodiments of the invention seek~~is designed~~ to increase output from the electrode itself. The inherent output response from the electrode itself when a cooking medium of a given quality is applied to the electrode will hereinafter be referred to as "electrode gain." Embodiments of the~~This~~ invention use~~s~~ particular size, geometry, design, and construction of an electrode in order to provide high electrode gain. The specific values in embodiments of this invention have been carefully tested and may~~to~~ provide high electrode gain as an unexpected result.

[0008] ~~In an embodiment of the invention, an open fryer is configured to measure cooking medium quality within the open fryer. The open fryer comprises a cooking vessel configured to store a cooking medium, an electrode plate completely immersed in the cooking medium, an insulator comprising a first side and a second side opposite the first side, wherein the first side of the insulator is fixed to a particular side of the electrode plate, and a second side of the insulator~~ According to a first aspect of the present invention, there is provided an electrode unit for use in a fryer system configured to measure cooking medium quality, the electrode unit comprising: an electrode plate comprising a first side and a second side opposite the first side, the electrode plate configured to be completely immersed in cooking medium, the electrode plate having a height, a width, and a thickness; an insulator having a first side formed on the first side of the electrode plate and covering a surface of the electrode defined by the height and the width, the insulator having a second side configured to attach to a cooking vessel of the fryer system; a guard ring configured to attach to the cooking vessel of the fryer system and surrounding the electrode plate and the insulator, wherein the guard ring is positioned to form a gap between the guard ring and the electrode plate and the insulator in the height and the width directions, wherein a size of the gap sets an electrode gain of the electrode plate, the guard ring configured to extend further from the cooking vessel than the electrode plate and the insulator; and the second side of the electrode plate having a smooth surface.

~~is attached to a wall of the cooking vessel, a guard ring fixed to the cooking vessel and surrounding the electrode plate and insulator, wherein the guard ring extends further away from the wall of the cooking vessel than the insulator and the electrode plate, and wherein the guard ring is positioned to form a gap between the guard ring and the electrode plate, wherein a size of the gap is based on a height, a width, and a thickness of the electrode plate, and the gap substantially defines a gain of the electrode, and a signal conditioning circuit that measures the conductivity of the cooking medium applied to the electrode.~~

[0009] ~~In another embodiment of the invention, an open fryer is configured to measure cooking medium quality within the open fryer. The open fryer comprises a cooking vessel configured to store a cooking medium, an electrode plate completely immersed in the cooking medium, an insulator comprising a first side and a second side opposite the first side, wherein the first side of the insulator is fixed to a particular side of the electrode plate, and a second side of the insulator is attached to a wall of the cooking vessel, a guard ring fixed to the cooking vessel and surrounding the electrode plate and insulator, wherein the guard ring extends further away from the wall of the cooking vessel than the insulator and the electrode plate, and wherein the guard ring is positioned to form a gap between the guard ring and the electrode plate, wherein a size of the gap is based on a height, a width, and a thickness of the electrode plate, and the gap substantially defines a gain of the electrode, and a signal conditioning circuit that measures the conductivity of the cooking medium applied to the electrode.~~According to a second aspect of the present invention, there is provided a fryer configured to measure cooking medium quality, the fryer comprising: a cooking vessel configured to store a cooking medium; an electrode plate within the cooking vessel; an insulator comprising a first side and a second side opposite the first side, wherein the first side of the insulator is fixed to a particular side of the electrode plate, and a second side of the insulator is attached to a wall of the cooking vessel; a guard ring fixed to the cooking vessel and surrounding the electrode plate and the insulator, wherein the guard ring extends further away from the wall of the cooking vessel than the insulator and the electrode plate, and wherein the guard ring is positioned to form a gap between the guard ring and the electrode plate, wherein a size of the gap sets an electrode gain of the electrode plate; and a signal conditioning circuit configured to measure the conductivity of the cooking medium when applied to the electrode plate.

[0010] Other objects, features, and advantages of the present invention will be apparent to persons of ordinary skill in the art in view of the foregoing detailed description of the invention and the accompanying drawings.