reagents **65** via structural coupling through base **62**. The sonication causes reagents **65** to mix, speeding the rate of reaction among reagents **65**. Under circumstances where well **66** holds binding reagents or other reagents located at a solid-phase support, the sonication may also increase the rate of mass-transport of reagents to and from the support, thus, speeding the rate of binding reactions at the solid-phase support.

[**0087**] In an alternate embodiment, assay cell **60** includes a plurality of wells **66** (not shown). Preferably, such wells are arranged in a conventional format, such as in a **96** or **384** well plate or the like.

[**0088**] **FIG. 6** illustrates a particular cross-sectional view of an assay cell **70** especially adapted for conducting ECL assays. Assay cell **70** includes a base **72**, a sonication device **74**, an electrical contact **76**, a solid-phase support **78**, a reaction enclosure **80**, and an electrode **82**.

[**0089**] Base **72** is preferably a rigid material shaped to define a reaction enclosure **80** and a passage **81**. Alternatively, base **72** is a flexible material (e.g. a thin plastic container or a blister-pack). Preferably, solid-phase support **78** forms a seal against base **72**. Support **78** and/or base **72** may also include one or more additional passages (not shown) through which reagents may be introduced or removed. In assays that utilize optical detection techniques, e.g., ECL, fluorescence, and chemiluminescence, base **72** is preferably a transparent material, such as acrylic or the like, that allows light generated within reaction enclosure **80** to be detected by a detector (not shown) coupled to base **72**. Base **72** may, alternatively, include a transparent window (not shown). Optionally, passage **81** may be omitted.

[**0090**] Sonication device **74** is a device for sonicating support and is structurally coupled to solid-phase support **78**. It is preferred that sonication device **74** comprises a piezoelectric sonication device. Device **74** is preferably controlled by a sonication controller (not shown) such as an electrical control circuit or the like. In an alternate embodiment, sonication device **74** may also be coupled to base **72**.

[**0091**] Electrical contact **76** is an electrically conductive material coupled to solid-phase support **78**. In ECL and other electrochemical assays, electrical energy is supplied to solid-phase support **78** (working electrode) via electrical contact **76**. Alternately, electrical contact **76** is a metal contact on sonication device **74** and device **74** is an electrically conductive material coupled to support **78**. Similarly, electrode **82** (counter electrode) comprises electrically conductive material coupled to reagents **84**.

[**0092**] Solid-phase support **78** supports reagents **79**, such as binding reagents. In ECL assays, solid-phase support **78** preferably functions as an electrode for inducing ECL among reagents **79** and/or reagents **84**. In an especially preferred embodiment, solid-phase support **78** comprises a fibril-polymer composite electrode. Preferably, solid-phase support **78** is mounted such that the transmission of sonication energy from device **74** to base **72** is minimized. Alternatively, support **78** may be mounted so that support **78** transmits sonication energy from device **74** via base **72** to the entire surface of reaction enclosure **80**. Support **78** and electrode **82** are preferably coupled to a power supply (not shown) to create an electrochemical cell. Assay cell **70** may additionally include a reference electrode (not shown) which is in electrical contact with reagents **84**.

[**0093**] Although device **74** is shown immediately abutting support **78**, a small space may exist between device **74** and support that allows device **74** to expand and contract or to otherwise move during sonication.

[**0094**] Reaction enclosure **80** is preferably a void in base **72** in which reagents **84** may be introduced and subjected to sonication to promote mixing and reaction. Alternatively, reaction enclosure **80** may comprise a separate enclosure, preferably comprising transparent material, coupled to base **72**.

[**0095**] In operation, reagents **84** are introduced into reaction enclosure **80**, preferably via passage **81**. Sonication device **74** is energized and directly sonicates support **78** which transmits such energy to reagents **84**. Depending upon the mounting of support **78**, sonication energy may also be transmitted to base **72** which conducts such energy to reaction enclosure **80**, and thus to reagents **84**. The sonication causes reagents **84** to mix, speeding the rate of reaction among reagents **84** and the rate of mass transfer of reagents **84** to and from reagents **79** on support **78**.

[**0096**] An exemplary embodiment of a binding assay utilizing cell **70** in an ECL detection system is described in the following. Reagents **84**, including an electrochemiluminescent moiety, e.g., linked to an analyte or to the binding partner of an analyte, are introduced into enclosure **80**. The presence of an analyte of interest in sample reagents **84** will lead to increased or decreased binding (directly or indirectly) of the electrochemiluminescent moiety to reagents **79** on support **78**. Sonication energy supplied by device **74** significantly increases the rate of mass transfer of reagents **84** to support **78** and reagents **79** thereon, thereby increasing the rate of binding reactions between reagents **79** and **84** and decreasing the time required to make an ECL measurement. Electrical energy is applied to support **78** to cause the electrochemiluminescent moiety to luminesce. The light produced by the ECL reaction may be measured while sonication device **74** operates or thereafter.

[**0097**] In another alternative embodiment, a dry reagent (not shown) is prestored in reaction enclosure **80** and liquid reagents are introduced into reaction enclosure **80** to directly contact said dry reagent. Upon activation of sonication device **74**, the dry reagent and liquid reagents **84** intermix at a significantly faster rate than would occur in the absence of sonication. The intermixed reagents may react, e.g., with each other and/or with reagents **79** on a solid-phase support, or other reagents may then be added to the mixture and also intermixed and allowed to react.

[**0098**] It has been noted that the interior surfaces of reaction enclosure **80** may become coated with a substance (not shown) that interferes with a desired assay reaction. This interfering substance may include a contaminant, cellular debris, a non-specifically bound reagent, a reaction byproduct, or the like. In yet another embodiment of the present invention, sonication device **74** is activated to remove such an interfering substance from reaction enclosure **80**. Sonication energy provided by sonication device **74** is transmitted to enclosure **80** and is utilized to remove the interfering substances from the interior surfaces of enclosure **80**. Sonication increases the rate of mass transport at the surfaces.

[**0099**] As an example, an ECL assay process involving binding reactions at an electroactive solid-phase support **78**