Supporting Information

Recent Advances in Flexible and Wearable OLEDs for Biomedical Applications: A Review

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PBM [Photobiomodulation]

: A noninvasive light therapy that uses low-intensity light to stimulate biological responses in tissues. It can modulate (inhibit or stimulate) various cellular processes, resulting in effects such as pain reduction, inflammation reduction, improved immune function, and enhanced tissue healing and regeneration.

PDT [Photodynamic Therapy]

: A treatment that destroys abnormal cells using light-sensitive drugs (e.g. photosensitizers) and a light source.

PTT [Photothermal Therapy]

: A cancer treatment method that uses light energy to generate heat and cause local thermal damage to tumors. Primarily uses infrared light.

HIL [Hole Injection Layer]

: The layer closest to the anode in the OLED, and is the layer that allows holes to easily enter the light-emitting layer or hole transfer layer.

HTL [Hole Transfer Layer]

: The layer that optimized to facilitate the movement of holes within electronic devices and optoelectronic devices.

EML [Emission Layer]

:A layer in which holes and electrons combine to convert photons and heat energy into light. Depending on the type of material, it can emit light of various wavelengths.

ETL [Electron Transfer Later]

: The layer that optimized to facilitate the movement of electrons within electronic devices and optoelectronic devices.

EIL [Electron Injection Layer]

: The layer closest to the cathode in the OLED , and is the layer that allows electrons to easily enter the light-emitting layer or electron transfer layer.

EQE [External Quantum Efficiency]

:External quantum efficiency is the efficiency that indicates how much light generated by electron-hole combination in OLEDs is extracted to the outside. If 100 electron-hole pairs are extracted as 20 photons, it can be interpreted as having an EQE of 20%.

SPPs [Plasmon Polaritons]

: Surface plasmon polaritons (SPPs) are electromagnetic surface waves that propagate along the interface between a metal and a dielectric (or air), arising from the coupling of the electromagnetic field with collective oscillations of free electrons in the metal, typically occurring at optical or infrared frequencies

TDMs [Transition Dipole Moments]

: The transition dipole moment or transition moment, usually denoted as a transition between an initial and final state, is the electric dipole moment associated with a transition between two states.

PLQY [photoluminescence Quantum Yield]

: The photoluminescence quantum yield (PLQY) quantitatively characterizes the efficiency of a photoluminescent process, and is defined as the ratio of emitted photons to absorbed photons by the material.

TADF [Thermally Activated Delayed Fluorescence]

: Thermally activated delayed fluorescence is a process in which ambient thermal energy changes the excited state of a molecular compound, thereby changing its light emission. It can achieve internal photon conversion rates close to 100%, enabling emission from both triplet and singlet states.

EL [Electroluminescence]

: Electroluminescence is a phenomenon in which a material such as a semiconductor emits light when an electric field is applied to it.

MMLCT [Metal Metal to Ligand Charge Transfer]

: In complexes where two metal centers are bonded, it is an electronic transfer process in which electrons move from the metal-metal bonding orbital to the ligand. When MMLCT occurs in complexes with Pt–Pt bonds, unique photophysical properties (e.g., red luminescence) can appear.

WVTR [Water Vapor Transmission Rate]

: It stands for water vapor transmission rate. Simply put, it is an indicator of how much water vapor moves through packaging materials or films.

ALD [Atomic Layer Deposition]

: Atomic layer deposition is a process that forms thin films one atom at a time. The growth rate of the thin film is slow, the quality of the thin film is excellent and thickness control is easy.

PDMS [Polydimethylsiloxane]

: This is a silicone polymer with a wide variety of uses, from cosmetics to industrial lubrication and passive daytime radiative cooling.

PET [Polyethylene Terephthalate]

: It is the most common thermoplastic polymer resin in the polyester family, used for textiles for clothing, containers for liquids and foods, thermoforming for manufacturing, and in combination with glass fibers for engineering resins.

PI [Polyimide]

: This material has high heat resistance and is used in a variety of fields requiring robust organic materials, such as high-temperature fuel cells, displays, and various military applications.

TFTs [Thin Film Transistors]

: Thin film transistors are a type of field effect transistor that are made in the form of a thin film. They are basically three-terminal devices. They are mainly used in displays and stacked devices.

DFT [Density Funtional Theory]

: Density functional theory is a theory that uses quantum mechanics to calculate the shape and energy of electrons inside a substance or molecule. Through this, it is possible to predict whether a molecule can exist in the world or not, the shape and properties of a specific molecule, etc.

HOMO [Highest Occupied Molecular Orbital]

: The highest occupied molecular orbital (HOMO) is the molecular orbital with the highest energy that contains electrons in a molecule. HOMO represents the highest energy level that an electron can occupy in a molecule before being excited to a higher energy level.

LUMO [Lowest Unoccupied Molecular Orbital]

: The Lowest Unoccupied Molecular Orbital (LUMO) is the lowest energy level in a molecule that is not occupied by an electron in the ground state. It represents the lowest energy level to which an electron can be added to the molecule, and is also called a frontier orbital.

DBR [Distributed Bragg Reflectors]

: A distributed Bragg reflector (DBR) is a reflector used in waveguides, such as optical fibers. It is a structure formed from multiple layers of alternating materials with different refractive index, or by periodic variation of some characteristic (such as height) of a dielectric waveguide, resulting in periodic variation in the effective refractive index in the guide.

ROS [Reactive Oxygen Species]

: Reactive oxygen species (ROS) are unstable oxygen-containing molecules that can readily react with other molecules, potentially causing damage. ROS are produced during normal cellular metabolism and can act as signaling molecules, but high concentrations can cause oxidative stress and damage to cell structure.

PS [photosensitizers]

: A photosensitizer is a molecule that absorbs light when exposed to light and transfers the absorbed energy to another molecule, causing a photochemical reaction. This energy transfer can cause a variety of effects, including the production of reactive oxygen species, cell death, or the initiation of other chemical reactions.

PTA [Photothermal Agents]

: Photothermal agents (PTA) are substances that convert light energy into heat when exposed to light, a process called photothermal conversion. This heat can be used for a variety of purposes, most notably in photothermal therapy (PTT) for cancer treatment. Photothermal therapy selectively removes or damages tumor cells through localized heating.

CCO [Cytochrome C Oxidase]

: CCO (cytochrome c oxidase) is the terminal enzyme complex in the respiratory chain of mitochondria and some bacteria. It is responsible for the final step of cellular respiration, reducing oxygen to water and using the energy released to pump protons across the membrane. This proton pumping creates a gradient that promotes ATP synthesis. This can increase cell growth rates.

ATP [Adenosine Triphosphate]

: Adenosine triphosphate is an organic compound that provides energy for various life activities in living cells, such as muscle contraction, conduction of excitement in nerve cells, and material synthesis.

hADSCs [human Adipose-Derived Stems Cells]

: hADSC (human adipose-derived stem cells) are stem cells extracted from adipose tissue. They are a type of mesenchymal stem cell (MSC) and are known to be able to differentiate into various cells such as bone, cartilage, fat, and muscle cells. hADSC can be easily obtained from adipose tissue, making it a resource that can be easily utilized in the field of stem cell research and treatment.

HOMA-IR [homeostasis model assessment of IR]

: HOMA-IR (Homeostasis Model Assessment of Insulin Resistance) is a method of estimating insulin resistance based on fasting blood glucose and insulin levels. It is a quick and relatively easy way to assess your body's response to insulin, a key indicator of potential health problems such as type 2 diabetes or metabolic syndrome.

CMOS [Complementary Metal-Oxide-Semiconductor]

: CMOS or COS-MOS is a type of integrated circuit used to construct digital circuits such as microprocessors and SRAMs. It is a semiconductor chip that is powered by a small battery built into the main board and can maintain stored configuration information even when the power is turned off.

MEA [microelectrode array]

: A microelectrode array (MEA) (also called a multielectrode array) is a device containing multiple (tens to thousands) microelectrodes that acquire or transmit neural signals, essentially acting as a neural interface that connects neurons to electronic circuits.

fNIRs [Functional Near-Infrared Spectroscopy]

: fNIR is a noninvasive neuroimaging technique that measures brain activity by detecting changes in cerebral blood flow using near-infrared light. It measures the concentration of oxyhemoglobin and deoxyhemoglobin in brain tissue to indicate brain activity.

IND [Investigational New Drug]

: An IND is a substance, often a drug or biological product, that has not been approved for general use by the FDA and is being studied in clinical trials to determine its safety and efficacy. Essentially, an IND is a "request for permission" from the FDA to begin testing a new drug in humans.