NEW ORGANIC COMPOUNDS FOR THE PREPARATION OF TUNABLE OLEDs

DESCRIPTION FO THE INVENTION

Universitat Jaume I has developed two families of pyrene-based nitrogen-donor compounds, given that pyrene is the chromophore of choice in fundamental and applied photochemical research. The synthesis of these compounds involves four steps at the most, which results in the generation of lower amounts fo waste and the minimization of the use of auxiliary reagents and solvents. These compounds are tunable, that is to say, small changes in the original structure would make it possible to tune the photophysical properties of the final compound. More precisely, these two families of compounds are:

1. Neutral pyrene-based organic compounds. These compounds can be prepared on a large scale and have proved to be very stable. They show strong emission in the blue portion of the electronic spectra and high quantum yields (in the range of 0.5).
2. Pyrene-based organic salts. These salts have been prepared starting out with the abovementioned neutral compounds. This transformation, which is almost quantitative in all cases, involves just a single-step reaction. The salts thus prepared are highly robust, show strong emission in the blue portion of the electronic spectra and offer moderate quantum yields.

The compounds described above have been characterized and purified by means of routine experimental techniques. Furthermore, their photophysical properties have been studied using the equipment available to the research group.

The compounds described earlier will be incorporated into the *active region* layer along with a suitable *host*. OLEDs have been studied for a long time and nowadays it is well understood how they work. The so-called host does not work properly by itself since it would emit in the ultraviolet portion of the electronic spectra and the voltage required to run the devices would be very high, although efficiency can be improved by adding an organic or organometallic emitter. Since this technology allows the OLED to work at low voltages, the device is under less electronic strain and therefore exhibits longer emission lifetimes.

SECTORS FOR COMMERCIAL APPLICATION

The proposed technology is useful for the electronic components, semiconductors and lighting industries.

TECHNICAL ADVANTAGES AND COMMERCIAL BENEFITS

The main advantages of the technology are:

- They are tunable systems; hence, small changes can be introduced into the proposed structure to tune the photophysical properties of the final compound according to the particular needs in each case.
- These materials will allow the manufacture of solution-processable OLEDs, thus resulting in a cheap, scalable and more convenient method for industrial purposes (such as inkjet printing).
- These materials are soluble in non-toxic solvents (e.g., ethanol or acetonitrile) and can thus be processed without the need to use highly toxic halogenated solvents.
- The structure of the proposed molecules allows electronic communication throughout the poly-aromatic system, thus improving the efficiency of the device.

The proposed compounds exhibit tunable electronic and physical characteristics, including solution-based and solid-state fluorescence. Therefore, they can be incorporated into the devices using solution processes, thus avoiding the use of vacuum deposition and lowering the costs. In addition, the incorporation of ionic moieties in emissive compounds has been credited with endowing high thermal stability. The structure of the proposed molecules allows electronic communication through the poly-aromatic system, which can give

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rise to new and improved efficiencies.

STAGE OF DEVELOPEMENT OF THE TECHNOLOGY

The technology is currently being implemented through a proof-of-concept project that aims to manufacture OLEDs bearing the pyrene-based compounds. The main goal of this valuation project is to test whether the devices exhibit promising electrochemical and luminescent properties as well as higher stability.

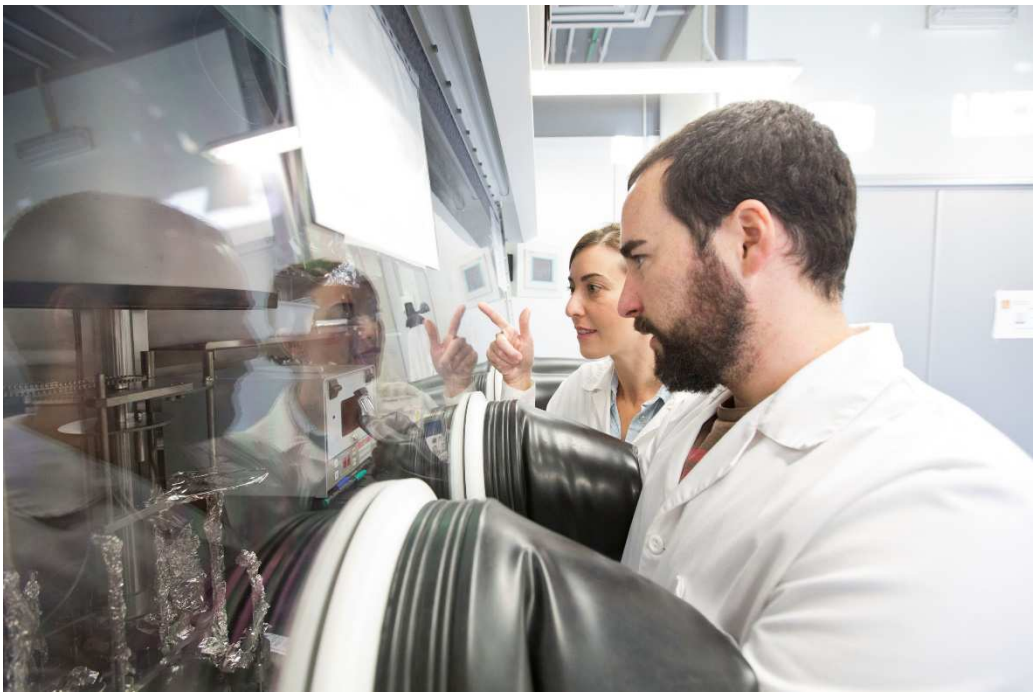
INTELLECTUAL PROPERTY RIGHTS

A Spanish patent has been applied for with the reference P201331318 and filing date 09/10/2013. In process of internationalization by PCT.

COLLABORATION SOUGHT

- License agreement for use, manufacturing or commercial exploitation.
- R&D for further development of the invention or for exploring its applications in other industrial sectors.

RELATED IMAGES



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