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CUPRATE OLEDs A new copper-based substance class for application in organic light diodes (UN528)

THE PROBLEM

Organic light emitting diodes, OLEDs for short, have already been traded for some time as the innovative light of the future with applications in flexible displays and large panel lighting. Currently special attention is paid in the research regarding electro luminescent materials in which expensive precious metals such as platinum and iridium are replaced for cost-efficient and more sustainable solutions. New materials suitable for application in e.g. OLEDs should possess properties such as good availability, facile synthetic procedure, no precious metals, good solubility, great thermal stability in the solid and in solution, good resistance to water and air, and also efficient luminescence. This new compound class on the basis of organometallic copper compounds especially suits these purposes.

THE SOLUTION

Chemists at the University of Bremen discovered a new substance class which, based on special organometallic copper compounds (cuprates), can be synthesized without difficulty from inexpensive starting materials. Compounds of the new class display exceptional luminescence properties, that is, for instance, very sharp emission and an extraordinarily high quantum efficiency. An exemplary copper compound according to invention contains a tetranuclear copper cluster. This Cu₄ core is surrounded almost completely by a ligand system, a structural arrangement which accounts for a high thermal stability and structural integrity in solution. The core innovation is that the ligand system protects the labile and otherwise extremely air/moisture-sensitive copper-carbon bond. It allows for the exploitation of this structural motif and substitutes the widely used iridium-carbon bond as a key feature for the luminescent properties. It is remarkable that the high complexity of the compound can be realized by very simple synthetic reactions.

ADVANCES AND APPLICATIONS

- Easy, efficient and inexpensive synthesis of novel copper clusters
- Intensive luminescence
- Resistance to oxidation and hydrolysis
- Very good solubility in various organic solvents
- Applicable in OLEDs as a replacement for rare, expensive precious metals
- Recyclable

The cuprate compounds are suited as potential, robust and inexpensive materials to be built into OLEDs. OLEDs are used for manufacturing flexible displays and for innovative surface illumination. The invention can support the further development of OLEDs and their application in products.



The ligand system stabilizes the Cu₄ core.



The new copper compounds possess an extraordinary high luminescent efficacy.

FIELD OF APPLICATION

Light diodes, OLEDs,
surface illumination

KEYWORDS

Organometallic copper compounds,
cuprates, luminescence, light-active
molecules

PROPERTY RIGHTS

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University of Bremen, Germany



InnoWi GmbH
Fahrenheitstraße 1
28359 Bremen
Germany
Tel.: 0421- 96 00 7 - 0
mail@innowi.de
www.innowi.de