Toward Methuselah—long-living lighting devices

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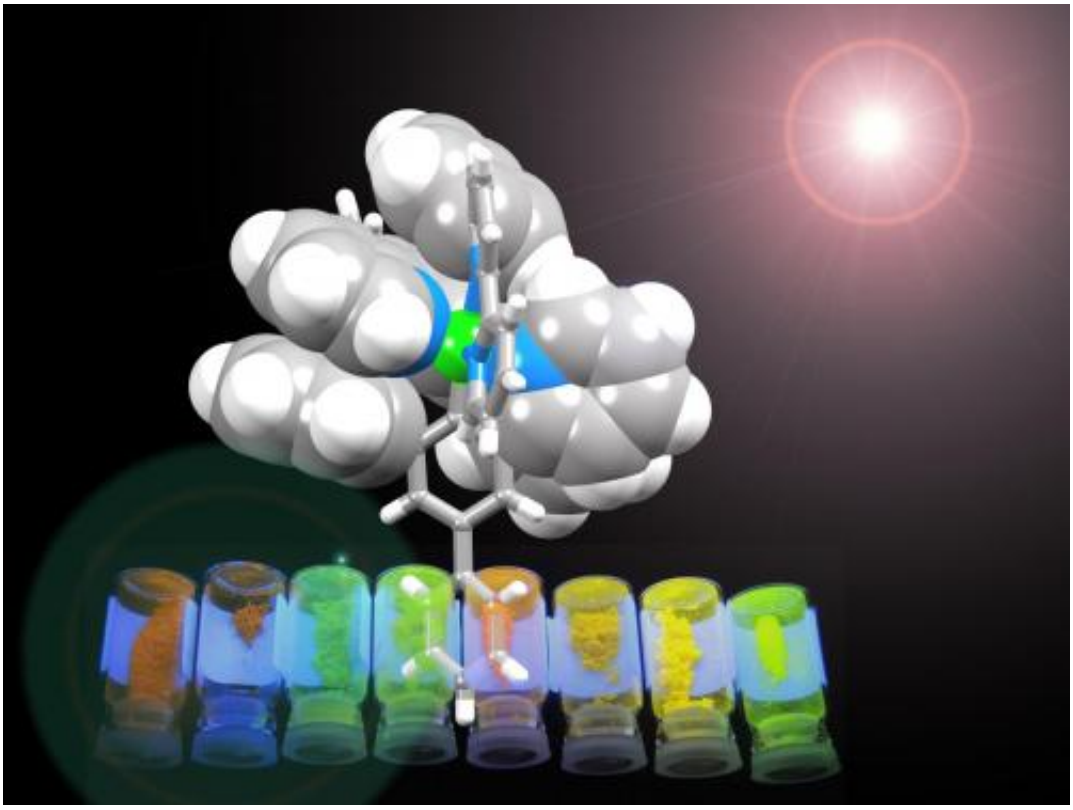

The iridium metal center is wrapped in an organic coat which protects it in the LEC. The precise chemical structure of the coat allows the researchers to tune the color of the emitted light. Credit: © University of Basel

Researchers at the Universities of Basel and Valencia have reported important advances in the development of next generation lighting technologies in the journal *Chemical Science*.

Lighting technology is in a state of change. The old-fashioned light-bulb, which was more efficient at converting electricity into heat than light, is currently being replaced by fluorescent devices and it is expected that light emitting diodes (LEDs) will be the technology of choice in the mid-term future.

The research group lead by Basel professors Catherine E. Housecroft and Edwin C. Constable describes the design of new molecular components and strategies for the preparation of light-emitting electrochemical cells (LECs) with remarkable lifetimes.

Simpler and less demanding LECs

LEDs have the disadvantage that they are complex, multilayered devices that require high-vacuum and high temperature techniques for their preparation. They also need to be rigorously protected from exposure to air or water. LECs are much simpler devices, comprising only one layer of active material, which can be solution-processed in ambient conditions.

To date, LEC devices have had relatively short lifetimes which have precluded serious commercial investigation. The Basel and Valencia teams have shown that devices with lifetimes exceeding 2500 hours can now be prepared using molecular components stabilized by so-called aromatic rings.

The team has built metal complexes decorated with rings that arrange themselves to form a shell around the molecule. "It is a little bit like a flower closing up at night - the flat, petal-like rings fold up about the metal to make a compact and robust structure", says Constable. These supramolecular interactions make the complexes exceptionally stable. Furthermore, molecular tuning of the components allows a tuning of the color of light emitted, bringing the goal of white-light emitting devices

one step closer.

More information: Andreas M. Bünzli, Edwin C. Constable, Catherine E. Housecroft, Alessandro Prescimone, Jennifer A. Zampese, Giulia Longo, Lidón Gil-Escrig, Antonio Pertegás, Enrique Ortí and Henk J. Bolink, Exceptionally long-lived light-emitting electrochemical cells: multiple intra-cation π-stacking interactions in [Ir(C^N)2(N^N)][PF6] emitters, *Chem. Sci.,* 2015, 1-10 | DOI: 10.1039/c4sc03942d

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