Synthesis, study, and application of Pd(II) hydrazone complexes as the emissive components of single-layer light-emitting electrochemical cells.

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For the first time, square planar Pd(II) complexes of hydrazone ligands have been investigated as the emissive components of light-emitting electrochemical cells (LECs). The neutral transition metal complex, $[Pd(L^1)_2]\cdot 2CH_3OH$ (**1**), (HL^1 = (*E*)-*N*′-(phenyl(pyridin-2-yl)methylene)isonicotinhydrazide), was prepared and structurally characterized. Complex **1** displays quasireversible redox properties and is emissive at room temperature in solution with a λ_{max} of 590 nm. As a result, it was subsequently employed as the emissive material of a single-layer LEC with configuration FTO/**1**/Ga/In, where studies reveal that it has a yellow color with CIE(*x*, *y*) = (0.33, 0.55), a luminance of 134 cd cm^{-2}, and a turn-on voltage of 3.5 V. Protonation of the pendant pyridine nitrogen atoms of L^1 afforded a second ionic complex $[Pd(L^1H)_2](ClO_4)_2$ (**2**) which is also emissive at room temperature with a λ_{max} of 611 nm, resulting in an orange LEC with CIE(*x*, *y*) = (0.43, 0.53). The presence of mobile anions and cations in the second inorganic transition metal complex resulted in more efficient charge injection and transport which significantly improved the luminance and turn-on voltage of the device to 188.6 cd cm^{-2} and 3 V, respectively. This study establishes Pd(II) hydrazone complexes as a new class of materials whose emissive properties can be chemically tuned and provides proof-of-concept for their use in LECs, opening up exciting new avenues for potential applications in the field of solid state lighting.

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