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材料合成及性能

一种橙光磷光铱(III)配合物的合成、晶体结构及光电性质研究

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摘要：采用二氯甲烷为溶剂,无水碳酸钾为缚酸剂,在25℃温和条件下,以2-苯基-4-甲基喹啉铱(III)氯桥二聚体[(4m2pq)₂Ir(μ-Cl)₂Ir(4m2pq)₂]和乙酰丙酮(Hacac)进行配位,反应合成了新型铱(III)配合物[(4m2pq)₂Ir(acac)]。通过核磁共振氢谱(¹H NMR)、碳谱(¹³C NMR)、X射线单晶衍射等确定分子结构,利用紫外-可见吸收光谱、发射光谱对其光物理性质进行研究。结果表明:(4m2pq)₂Ir(acac)的单晶结构属三斜晶系,空间群为P1; (4m2pq)₂Ir(acac)在二氯甲烷溶液中呈橙光发射,发射峰为597 nm,磷光寿命0.33 μs,量子效率达50.4%。以(4m2pq)₂Ir(acac)为客体掺杂在CBP中,制备了结构为ITO/NPB(30 nm)/CBP:(4m2pq)₂Ir(acac) (质量分数6%和 8%, 20 nm)/BCP(10 nm)/Alq₃(20 nm)/LiF(1 nm)/Al(150 nm)的橙光磷光有机电致发光器件,器件的最大亮度达到39 667 cd/m²,发射峰位于597 nm,最大电流效率为14.2 cd/A,最大功率效率为8.1 lm/W。

关键词：2-苯基-4-甲基喹啉 乙酰丙酮 铱(III)配合物 OLEDs

Synthesis, Crystal Structure and Photophysical Properties of Iridium(III) Complex Based on 4-methyl-2-phenylquinoline and Pentane-2,4-dione Ligands

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Abstract: A metal complex[(4m2pq)₂Ir(acac)] was synthesized under mild condition of dichloromethane as solvent and potassium carbonate as deacid reagent at 25℃, where "4m2pq" is the ortho-C-deprotonated derived from 4-methyl-2-phenylquinoline and "acac" is derived from pentane-2,4-dione. The molecular structure of (4m2pq)₂Ir(acac) was characterized by ¹H NMR spectral, ¹³C NMR spectrum and X-ray diffraction. UV-visible absorption spectrum, photoluminescence spectrum, luminescence quantum yields and phosphorescence lifetime were measured for studying photophysical properties of (4m2pq)₂Ir(acac). The single crystal structure of (4m2pq)₂Ir(acac) is in triclinic and space group P1. The orange phosphorescent emission with high fluorescence quantum efficiencies of 50.4% and lifetime of 0.33 μs can be observed with peaks at 597 nm in degassed CH₂Cl₂ solution at room temperature. Moreover, (4m2pq)₂Ir(acac) was utilized as phosphorescence dopant in OLEDs with the structures of ITO/NPB (30 nm)/CBP:(4m2pq)₂Ir(acac) (mass fraction of 6% and 8%, 20 nm)/BCP (10 nm)/Alq₃ (20 nm)/LiF (1 nm)/Al. The device showed orange emission at 597 nm, maximum brightness of 39 667 cd/m², current efficiency of 14.2 cd/A, and power efficiency of 8.1 lm/W.

Keywords: 4-methyl-2-phenylquinoline pentane-2,4-dione iridium(III) complex OLEDs

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