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The Organic-Inorganic Hybrid Encapsulation Layer of Aluminium Oxide and F-Alucone for Organic Light Emitting Diodes

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Nowadays, Active Matrix Organic Light-Emitting Diodes (AM-OLEDs) are the superior display device due to their vivid full color, perfect video capability, light weight, low driving power, and potential flexibility. One of the advantages of AM-OLED over Liquid Crystal Display (LCD) lies in its flexibility. The potential flexibility of AM-OLED is not fully explored due to its sensitivity to moisture and oxygen which are readily present in atmosphere, and there are no flexible encapsulation layers available to protect these. Therefore, we come up with a new concept of Inorganic-Organic hybrid thin film as the encapsulation layer. Our Inorganic layer is Al₂O₃ and Organic layer is F-Alucone. We deposited these layers in vacuum state using Atomic Layer Deposition (ALD) and Molecular Layer Deposition (MLD) techniques. We found the results are comparable to commercial requirement of 10⁻⁶ g/m² day for Water Vapor Transmission Rate (WVTR). Using ALD and MLD, we can control the exact thin film thickness and fabricate more dense films than chemical or physical vapor deposition methods. Moreover, this hybrid encapsulation layer potentially has both the flexibility of organic layers and superior protection properties of inorganic layer.

Keywords: OLED, encapsulation, ALD, MLD