Introduction to Organic Vapor Phase Deposition (OVPD®) technology for organic (opto-)electronics

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The fast evolving field of organic electronics requires more flexible but also production capable deposition technologies for the upcoming opto-electronic devices and future applications of organic electronics. Here the OVPD technology offers the flexibility from single layer deposition with very specific, optimized material properties like surface roughness to complex device structures consisting of numerous layers of different materials. The later could either consist of a single organic material or a mixture. Figure 1 illustrates the concept for the combination of the OVPD® with the Close Coupled Showerhead® technology to achieve excellent thickness control and uniformities.

OVPD® offers the option to deposit sophisticated device designs at high rates (> 5nm.s^{-1}) and high uniformities (< 2%) on different substrate sizes leading to low cost of ownership. In addition, the option to either deposit film consisting form sharp or graded interfaces support the overall device optimization. Mixtures of three different organic materials were deposited like host with two organic dopants or host with dopant and co-host. For the later we achieved in combination with cross-fading layers an increase of 139% in luminous efficacy compared to the red OLED reference design. Furthermore, the morphology of the organic film, thus its physical properties, can be optimised and adjusted to the requirements of e.g. OLEDs or organic photovoltaics. We will discuss this in more detail focusing on the unique features of the OVPD® technology and its application for organic electronics.

Beside the OVPD technology and more device related issues also aspects of our prequalification of the organic materials by DSC, HPLC, or Calorimetry will be presented.

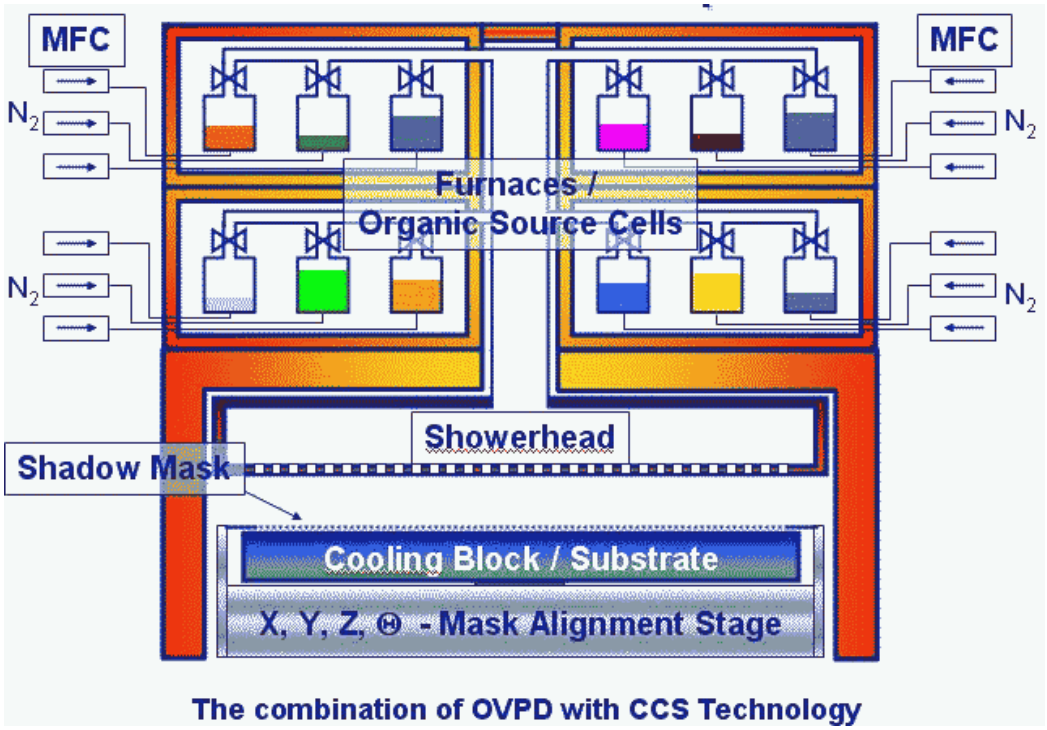

Figure 1. OVPD production concept combining Close Coupled Showerhead® with OVPD® technology. This approach enables a separate optimisation of source and deposition chamber on the specific process requirements.