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Facing target cathode: a low damage deposition process

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Low damage deposition processes are required e.g. for the production of high brightness light emitting diodes (HB-LEDs) and also for the development of future spintronic devices. In the case of LEDs, first a highly crystalline active area is grown by chemical vapor deposition (CVD). After this device processing a conductive and transparent film is desired to function as an electrode. Therefore a low damage film deposition process is used in order to not destroy the sensitive crystalline structure. Evatec has developed a facing target cathode (FTC) for the Clusterline®. The geometry of the FTC contains two facing targets that are perpendicular to the substrate and hence allow off-angle sputtering. The magnetic field is connected over a yoke behind the targets and therefore enhance the magnetic strength. The FTC has, in contrast to common magnetron devices, the magnetic field lines orthogonal to the targets. This is an advantage in the case of magnetic targets, since no magnetic shunt (due to the target) is introduced and the high magnetic flux of the FTC is improved. High energetic ions are a main source for damage. Plasma simulations were used to identify the origin of these charged ionic projectiles. The gained insight was used to modify the hardware and process parameters to obtain a soft deposition process. The investigated key parameters for low damage process (e.g. pressure, sputter power and magnet field strength) were studied. In order to be of interest for the mass production also a sufficient deposition rate is essential. The latter has been increased by using a series of FTCs and by adjusting the process parameters. It has been shown that the presented hardware can prevent the harming of the underlying film and hence is challenging common low energy deposition techniques as e.g. molecular beam epitaxy (MBE).

Keywords

low damage

facing target cathode (FTC)

facing target sputtering (FTS)

Clusterline