



## PRESS RELEASE

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### **Leybold Optics supplies vacuum systems for CIGS applications**

Leybold Optics GmbH, the internationally acting company based in Alzenau/Germany, is seen as a pioneering supplier of vacuum systems for CIGS applications. According to experts<sup>(1)</sup>, the share of thin film modules of various technologies in the world market will increase to 30 percent. Owing to the efficiency values that can be achieved, CIGS in the meantime counts as thin film technology with the greatest growth potential.

CIS or CIGS thin film modules consist of I-III-VI compound semiconductors that are used in various combinations. The abbreviation CIGS stands for the elements that are used: copper (Cu), indium (In), gallium (Ga) and/or selenium (Se). There is a great potential for savings in CIGS technology - not only as far as energy expenditure is concerned, but also in respect of material and manufacturing costs. Thanks to the thinner layer thicknesses and depending on the substrate, flexible solar modules can also be manufactured.

Leybold Optics offers the full range of equipment for all vacuum based CIGS processes, be it on glass substrates or flexible substrates. In a first step, the substrate, for instance glass, is initially coated with molybdenum (Mo) that serves as back contact. Then the absorber is produced from the elements copper, indium and gallium, with subsequent heating in a selenium atmosphere. The final, conductive and transparent front contact consists of an aluminium-doped zinc oxide (AZO). Buffer layers that are for instance made of indium sulphide (In<sub>2</sub>S<sub>3</sub> CdS) and non-doped zinc oxide (ZnO) are located between absorber and front contact. The molybdenum and zinc oxide layers are produced by means of sputtering. For these applications, Leybold Optics offers horizontal (H-series) as well as vertical (A-series) sputtering systems. The absorber on the contrary may be produced by means of thermal evaporation or by sputter coating followed by subsequent heating in a selenium atmosphere.

Especially for this selenium process - but also for other applications - Leybold Optics has developed the selenium evaporator Selenia. The system that is already successfully marketed works with linear selenium sources, ensuring an excellent layer homogeneity even at extremely large throughputs. The principle of Selenia permits the selenium reservoir to be replenished during running production. The system can be used for all complex evaporation processes on flat



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substrates for photovoltaic applications. In view of the small amounts of selenium used, the high degree of productivity, the simple operation and low maintenance requirements, Selenia is a unique solution that has an extremely positive effect on the cost of ownership.

The RaPiT (Rapid Thermal Process Oven) rounds off the range of products offered by Leybold Optics to produce the important absorber layer. The semiconductor is formed inside the RaPiT with the aid of a reactive gas. In cooperation with a customer, the RTP furnace was developed by Leybold Optics with the objective of meeting the high requirements on a stringent process control and precise temperature guidance, while simultaneously achieving highest levels of productivity.

Further process steps to apply the buffer and the subsequent front contact layer are required to complete the CIGS solar cell. In this respect too, the machine platforms of the Leybold Optics H- and A-series with their corresponding configuration for the production of the zinc oxide (ZnO) and intrinsic zinc oxide (i-ZnO) layers significantly contribute to the manufacture of solar cells in production lines.

For complex, flexible applications, Leybold Optics offers the Roll-to-roll coating system, also called web-coater. The process is designed for substrates such as metal films or flexible synthetic materials and permits coating methods such as sputtering, evaporation, CVD (chemical vapour deposition) or combined solutions. The substrates are transported via a conveyor from roll to roll and are vacuum coated in the process, completely without touching the coated surface. With its special 360° design, the patented Leybold technology offers a fully automatic process, which apart from the production of flexible solar cells also permits further application ranges.

All systems offer a fully automatic process that not only allows the production of flexible solar cells but also a variety of other applications. In the meantime, CIGS systems from Leybold Optics are being used in large production facilities by world market leaders. All products from this thin film specialist are characterised by their high degree of reliability, availability and flexibility. Depending on the desired processes, the system concepts can be of vertical or horizontal design.



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### Source:

(1) Matthias Fawer, Bank Sarasin Sustainable Investment, Basel, 11<sup>th</sup> Solar study

### Image caption:

Leybold Optics versatile sputter tool for PV applications

### Image source:

Leybold Optics, Alzenau/Germany

### Company Profile:

Leybold Optics GmbH is one of the world's leading suppliers of vacuum technology. It also develops processes and manufactures complex high-end coatings. This reputed thin film specialist sets milestones in the fields of sputtering, PEVCD, plasma assisted evaporation, automation and software. It is organised into two divisions: Optics and Glass & Solar. The Glass & Solar division portfolio comprises vacuum systems for the photovoltaic industry and machines that are used to coat architectural glass, displays and other large-area applications. The Optics division markets deposition systems for precision optics, ophthalmic lens coating, the automotive and the electronics industry.

The foundation stone of its success was laid over 160 years ago by the founders and inventors Ernst Leybold and Wilhelm Carl Heraeus. Their pioneering spirit and dedication to research and the development of new production procedures is reflected in the market standards that have gained worldwide recognition since the company was founded. Today, Leybold Optics, which is traditionally committed to innovation and quality, is a global company that has more than 500 employees across the world.

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