Combinatorial Pulsed Laser Deposition System

- Stand-alone turn-key combinatorial PLD System.
- Continuous Composition Spreads of binary/ternary/quaternary phase spreads.
- No post anneal and no masks.
- Film growth under 'true' deposition conditions (such as 800˚C, 500mTorr).
- Wafer size: 2" diameter is standard (with 4" and 6" custom designs).
- Deposition of epitaxial films, multilayer heterostructures and Superlattices.
- Oxygen compatibility for oxide film depositions at high temperatures.

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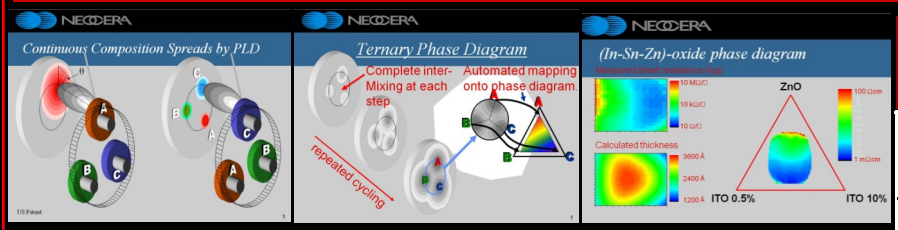
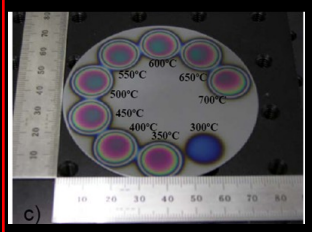
Combinatorial PLD /Continuous Composition Spreads

The ability to produce many different material compositions in a single deposition run greatly accelerates the time to arrive at an optimum composition having the desired material properties. Continuous Composition Spread PLD (CCS-PLD*)* is based on the deposition rate profiles naturally occurring in PLD as a result of the $Cos^n\theta$ ($5 \leq n \leq 11$) dependence. PLD-CCS benefits from the proven ease of multilayer depositions using Neocera software and the intrinsic forward-directed nature of the PLD process to vary the composition of a binary/ternary/quaternary phase spread. PLD-CCS varies the material in an analog scheme, rather than in discrete elements, thus eliminating the need for masks. This allows for a very rapid successive deposition of each constituent at a rate of much less than a monolayer per cycle, resulting in an approach that is fundamentally equivalent to a co-deposition method. The fact that this method does not depend on a post-deposition anneal to promote inter-diffusion or crystallization makes it applicable to studies where growth temperature is a critical parameter, or to situations where high-temperature anneals are incompatible with either the deposited material or the substrate. As no masks are used, this technique can operate in a wide dynamic range of pressures (up to about 500 mTorr) which are typically not possible in a mask-based approach. Neocera PLD systems can provide both combinatorial PLD (CCS-PLD) and standard PLD capabilities within the same system.

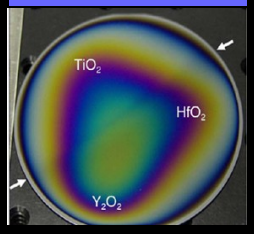


(Below) P. K. Schenck et al, Thin Solid Films S17(2008), 691-694/ Pioneer 180 Combinatorial PLD System, NIST, Gaithersburg, MD, USA.

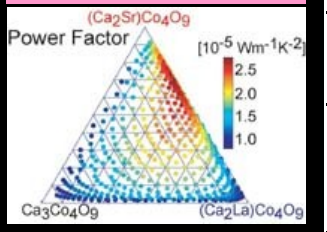
Graded Temperature TiO_2 Libraries (P-T Phase diagram)



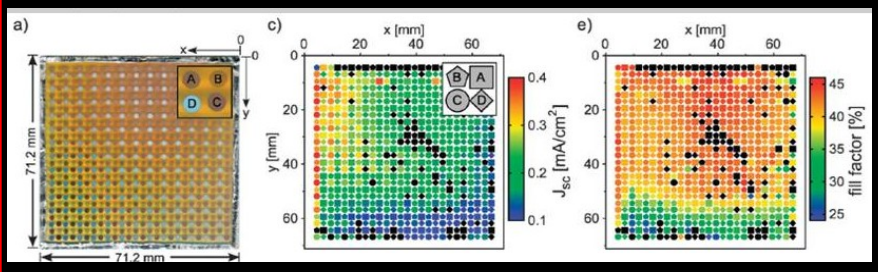
High-k Material Libraries



Thermoelectric Materials Libraries



(Below) Solar cell libraries for the investigation of different metal back-contacts for TiO_2-Cu_2O hetero-junctions *(S. Ruhle et al, Phys. Chem. Chem. Phys, 2014, 16, 7066)*. Pioneer 180-PLD System at Bar-Ilan University/Israel.



Combinatorial PLD System Specifications

	Feature	Details
1.	Substrate sizes	2" diameter standard. 4" and 6" on request.
2.	PLD Chamber size	12" or 18" diameter Spherical chamber.
3.	Base vacuum	5 x 10^{-7} Torr Standard 5 x 10^{-9} Torr (upgrade)
4.	Substrate heating	850˚C (2 " and 4" wafers) 750˚C (6" wafers)
5.	Target Carousel	6x 1" diameter
6.	Process gases	O_2, N_2, Ar, (MFC controlled)
7.	Substrate-Masks	Only for 1 cm x 1 cm size substrates
8	Load-locks	For Substrate.
9.	Automation	Windows 7, LabView 2013

For further information, please contact: sales@neocera.com or +1-301-210-1010, ext 104