

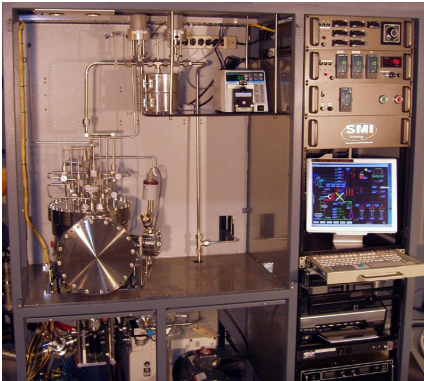


Structured Materials Industries, Inc.

SMI LiNbO₃ Deposition System and Process Development Services

Structured Material Industries, Inc. (SMI) provides custom demonstration services and/or tool fabrication solutions for thin film Lithium Niobate (LiNbO₃) material growth. LiNbO₃ is a promising material with desirable traits such as high electro-optic coefficient and excellent transparency in the visible and near infrared. LiNbO₃ can be deposited as an amorphous film using low temperatures. Some of the applications for LiNbO₃ films include waveguide-based electro-optical devices and surface acoustic wave devices.

SMI Custom LiNbO₃ Deposition Systems



The image shows an SMI built tool for LiNbO₃ growth.

SMI offers advanced design tools for researchers looking to grow LiNbO₃ materials within their own laboratory. The LiNbO₃ System is offered in a wide array of platter sizes including 3", 5", 7", 9", and 13" to accommodate researchers working with various wafer sizes. Further, the system can reach temperatures up to 900°C through resistive heating or 1100°C through induction heating. Another feature of the LiNbO₃ systems are the flash evaporator assembly which is used for quickly vaporizing the metalorganic precursors and providing a uniform vapor flux into the stainless steel reactor.

SMI LiNbO₃ Process Development Services

SMI offers Process Development Services for LiNbO₃ films by using an in-house SpinCVD™ Epic™ Series MOCVD system. The in-house SMI MOCVD system features cutting edge components such as a stainless steel high vacuum reactor chamber, SMARTCVD™ control system, and a dual flash evaporator assembly. The standard operation temperature for this process development service is ~900°C in oxidizing environments (with an option for higher temperatures). Demonstration services can also utilize the in-house dry nitrogen purged glove box for the handling of materials. SMI has existing MOCVD processes for LiNbO₃ film deposition on a variety of substrates; such as LiNbO₃ and Al₂O₃ (sapphire) single crystal wafers. To date, SMI has demonstrated growth of LiNbO₃ films over 3.0 μm!

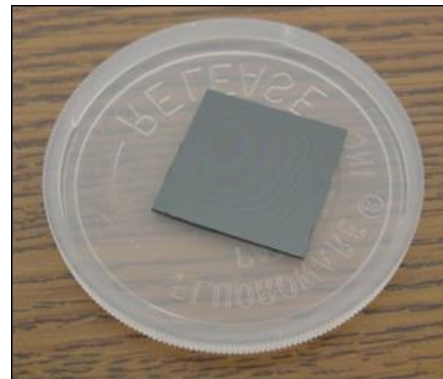
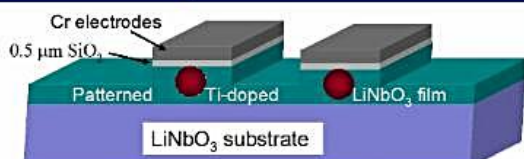
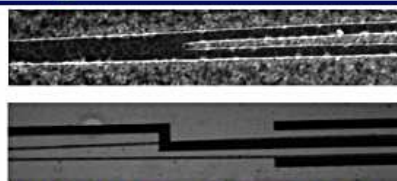


Image above shows an example of a 1" Ti Doped LiNbO₃ film on an LiNbO₃ crystal substrate coated by MOCVD using the SMI in-house LiNbO₃ Reactor.

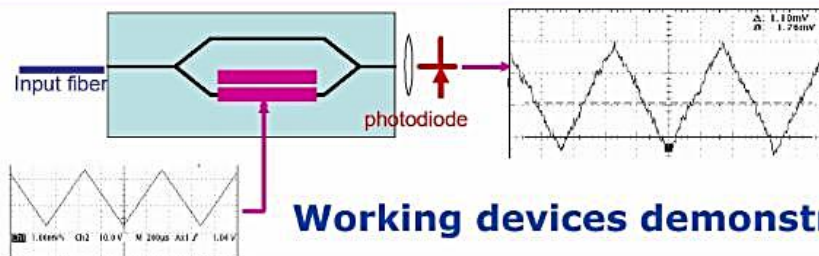
Example of SMI Development Capabilities: LiNbO₃ Waveguides Devices



We have observed light modulation in this device, demonstrating that the film is not only crystalline, but also has oriented ferroelectric domains.



SEMs of y-branch waveguide portion of MZ modulator and overlaid electrode pattern.



Working devices demonstrated

[Download Brochure](#)

[Structured Materials Industries, Inc.](#) (SMI), with over 60 fielded MOCVD tools and over 10 MOCVD, CST, FB-CVD, HVPE, and ALD process demonstration tools in-house, has extensive result oriented experience in providing materials, hardware, and device assistance to other businesses as well as research organizations. SMI is a leading provider of thin film research and development MOCVD, PECVD, and ALD deposition systems for electronic, optical and electro-optic device fabrication, among other applications. We produce systems for research and production, in sizes ranging from stand-alone systems to high volume production tools. SMI also maintains an in-house applications laboratory, with facilities for materials characterization and device fabrication that is used to support our customers material development efforts.

[Structured Materials Industries, Inc.](#) has an extensive history in working with customer/partners to deliver results in SBIR/STTR and other awards. We can provide a support infrastructure for writing award winning proposals and provide the physical support infrastructure for carrying out awarded programs through completing customer innovations or calling on collaborators to fulfill innovations. We are always open to confidentially exploring additional partnerships and collaborations. SMI has worked on various projects featuring LiNbO₃, ZnO, Gallium Oxide (in addition to other oxides), TMDs, AlGaIn, InGaIn, BN, Compound Semiconductors, Dielectrics, Ferroelectrics, Phase Change Chalcogenides, Carbides, Diamond, Battery and Fuel Cell Electrodes, Graphene, CNTs, Other Nanowires, Fuel Cell Materials, 2D Materials, Thin Film Batteries, Metals, and so on as well as has grown materials on a diverse set of substrates using in-house tools.

To take advantage of SMI material development or consulting services [contact us today](#) to get more information and quoted. SMI is also happy to participate in the development of proposals and budgetary quotations. Sign up today to become an SMI Follower!

demonstrated by SMI

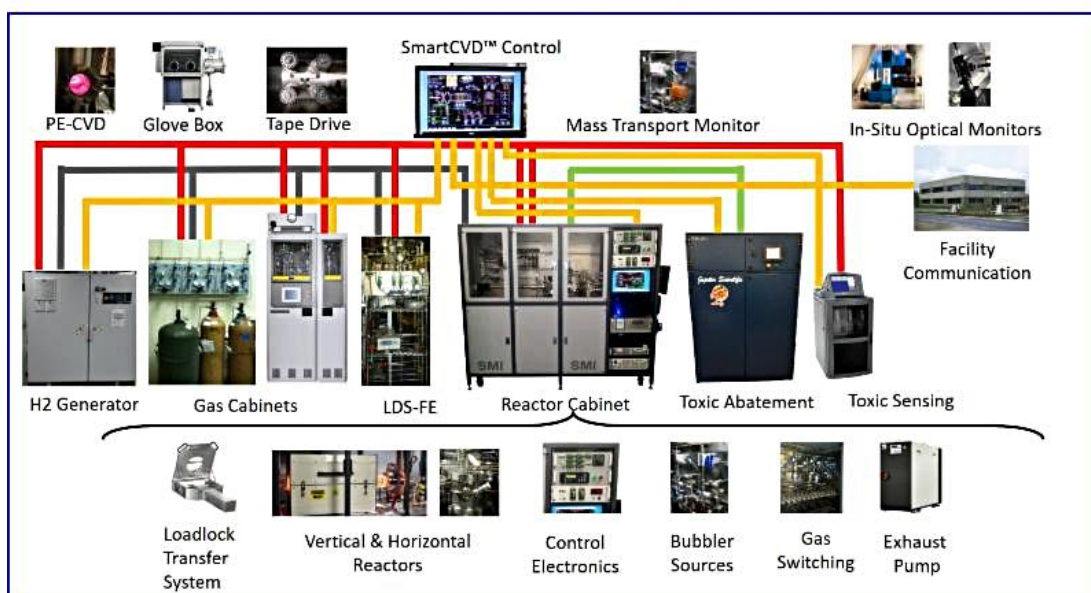
compatible with SMI



H																	He						
Li	Be															B	C	N	O	F	Ne		
Na	Mg															Al	Si	P	S	Cl	Ar		
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr						
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe						
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn						
Fr	Ra																						

La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

SMI Provides Complete Solutions



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