“THE MACHINE SHOP OF THE FUTURE”
• Cleanroom micro/nano fabrication
• Thin film deposition and photolithographic patterning
• Build sensors, actuators and microfluidics functions
• Electrical and magnetic characterization
• Laser microwelding and micromachining
• Conceptualizing, prototyping and failure analysis

MULTI-SCALE CORRELATIVE ANALYTICAL MICROSCOPY
• Electron, X-ray, ion and optical microscopy
• Imaging from cm scale to nm scale
• Elemental and chemical analysis
• Environmental (in-situ) imaging nm-µm scale (liquid phase + gas phase)
• 3D topographic and tomographic imaging (nm scale)
• Thin film characterization, morphology, preferred grain orientation, microstructure, thickness and n&k
• Nano hardness and modulus testing

“AN EXTENSION OF MY OWN LAB”
• Easy 24/7 industrial and academic access
• D.I.Y. R&D facilities and equipment billed per hour
• Subsidized low rates
• Preliminary data seed fund for competitive grant writing
• Consulting and engineering assistance or training
• WebEx remote microscopy sessions

TECHNICAL EXPERTISE AND CAPABILITIES
• Highly experienced professional staff
• Device design and integration engineering
• Back-end processing & packaging
• Microfluidics prototyping
• Co-located with bio-Imaging Core

LET’S GET STARTED!
• We’ll do the work for you or train you
• Hourly or project-based pricing
• Contact Dr. Ian Harvey at 801-585-6162 or IRHarvey@eng.utah.edu

UTAH NANOFAB AT THE UNIVERSITY OF UTAH
Sorenson Molecular Biotechnology Building
A USTAR Innovation Center
36 S. Wasatch Drive, Suite 2500
Salt Lake City, UT 84112
www.nanofab.utah.edu
Nano-scale Imaging & Surface Analysis
- JEOI JEM-2800 S/TEM with ultrafast EDS (3D tomo)
- Proctochips liq & gas phase ETEM / electrochemistry
- FEI Helios Nanolab 650i hi-res dBFIB, Nabity EBL
- Pt, W, C dep; XeF₂, I₂, H₂O enhanced etch, EDS, EBSD
- FEI Quanta 600 FE-ESEM w/ EDS, EBSD, particle ID, MAPS
- Kratos AxisUltra imaging XPS / Auger / ISS / UPS
- EDAX Eagle III Microspot XRF (µprobe & mapping)
- JEOI 5910 LV-SEM (quick-look inspection SEM)
- Bruker ICON-PT AFM: PF-QNM, wet cell, MFM, KPFM
- Woollam V-VASE spectroscopic ellipsometer
- Zygo NewView 5032 optical profilometer
- Micro fiducial laser cutter for correlative multiscale microscopy: 355, 532, 1064 nm; 1.2-15µm
- Vertex 220 microVu Digital Comparator
- SEM/TEM prep tool suite, manual and ion polishing
- Hysitron TI Premier Nanoindentor system

Cleanroom
LITHOGRAPHY (C-100) Pattern Generation & Transfer
- Heidelberg μPG 101 Laser Pattern Generator (x2)
- 0.9µm, 2.5µm write heads, gray scale patterning
- Nanofrazor 20-50nm nanolitho tool
- EVG EV-420, Suss MA1006 front & backside mask aligner
- OAI Models 200 & 810 (with BSA) contact aligners
- Spinners, ovens, hot plates, hoods, SRDs, . . .
- LOR 7B, AZ 9620, Shipley 1813, nLOF 2020
- YES HVMs vapor prime vacuum ovens

THIN FILM DEPOSITION (C-1000) Sputtering:
- TMV SS-40C: 8 dedicated cathodes, dual cryo-pumped
- Denton Discovery 18: 3 user config 3" cathodes, RF/DC
- Denton 635SSL: 4-cat, RGA, OES-feedback reactive sputter

Metals/Alloys: Ag, Al, Au/Si, Au, C, Chromel, Co, Cr, Cu, Cu/Ag, Ir, Ge, Fe, Ni, NiCr, NiCrFe, Nb, Pd, Pt, Si (p-type), Ta, Ti, TiW, V, W, Cr, Si, Zr, Hf

Oxides / Ceramics: Al₂O₃, SiO₂, ITO, BN, CeSm(ox), LaSrFe(ox), NaMnO₃, NdMgO, SiC, Si₃N₄, Ta₂O₃, TiO₂, YNizRO, YSZ, ZnO, MgO

Evap: Al, Ag, Au, Au/Ge, Cr, Cu, In, Mg, Mo, NiCr, Ni, Ta, Ti
- Denton e-beam DV-SJ/20C with 4 hearths, user config
- CHA 600 e-beam (Al, Mg)

PECVD: Oxford Plasmalab 80+: α-Si, Si₃N₄, SiONₓ, SiO₂
CVD: SCS PDS 2010 Parylene-C

ALD: Cambridge Fijji F200 w/ thermal & plasma dep modes, H₂O plasma (Pt, HFO₂, ZnO, Al₂O₃, SiO₂, TiO₂, MgO, ZrO₂)

FURNACES and DIFFUSION (C-1000) LPCVD
- Expertech TEOS/LTO/PSG/lo-stress Si₃N₄, α & phos-polySi
- Atmospheric & Rapid Annealing
- ProTemp wet/dry oxidation with DCE
- Allwin 610 RTP/RTA with O₂, N₂, Ar, H₂ forming gas, 200-1250°C

ETCH (C-1000) RIE and DRIE & Wet Chemical
- STS Aspect ICP DRIE: time-multiplex Si etch (anti-footing)
- Oxford Plasmalab 100+ ICP time-multiplex & cryo DRIE SF₆, CF₄, CHF₃, O₂, Ar, N₂
- Oxford Plasmalab 80+ multipurpose (SF₆, CF₄, O₂, Ar)
- Technics PEII H₂O₂, O₂ descum & resist strip
- Xactix Xetch XeF₂ silicon isotropic etch
- Plasmatherm 790 (2X, oxide and metal etch Cl₂, BCl₃ pending)
- Au etch station
- Custom KOH bulk Si etch station

MICROMACHINING
- JPSA Micromachining system Ar/F₂ 193 nm (pending)
- Reel-Tech LM4000 Nd-YAG (1064nm) laser micromachining

BACKEND PROCESSES & PACKAGING
- Strasbaugh 6EC 100 mm CMP (Si, SiO₂ polishing & planarizing)
- EVG 5200S wafer bonder (hot embossing, thermal & anodic)
- Disco DAD 641 & Disco 3220 dicing saws (std or UV tape)
- MEL wedge wirebonder with Au and Al wire
- TUI 9101 wire bond pull tester

MESO-SCALE PROTOTYPING
- LaserStar 1900 micro laser welder (1064nm, 150J)
- Viteris Technologies Precision Microwire EDM
- CO₂ Laser (dual laser cartridge, 25W + 75W, 1090nm)

CLEAN (class 10k) MICROFLUIDICS
- Omnicure 1000 UV curing (320-500nm)
- Lamination press
- Corona discharge UV/O₂ plasma treatment
- Fume hood with CEE Spinner Vacuum Oven Suite

CLEANROOM (C-1000) METROLOGY
- Keyence VHX-5000 3D microscope
- LEO 440 SEM
- n&k NKT 1500 thin film analyzer
- Nanometrics NanoSpec 3000 film thickness
- Magnetron Instruments 4-point probe
- Polyvar Met with DIC + many optical microscopes
- Nikon V12A optical comparator
- Tencor P-10 and P-20 stylus profilometers
- Tencor Flexus 2320 film stress analyzer

ELECTRICAL / MAGNETIC TESTING
- Verigy 9300 SOC IC tester
- Microsense vibrating sample magnetometer (EZ-7 VSM)
- Keysight 404A Mixed Signal O-scope
- Keysight E5061B Network Analyzer
- Keithley 4200 parameter analyzer with 4 SMUs
- Micromanipulator light-tight probe station

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University of Utah | College of Engineering | 36 S. Wasatch Dr. | Salt Lake City, UT 84112