

## Film Thickness Monitoring for ALD

	Colnatec	Inficon	Filmetrics	KLA Tencor	Wollam	K-Space
<b>Optical</b>						
- Expensive			X	X		X
- Thick film only			X	X		X
- Inconsistent results			X	X		X
- Difficult to use, difficult to calibrate			X	X		X
- Limited substrate type			X	X		
- Built into system			X	X		X
- Ex-situ (not real time)			X	X		X
- In-situ for (thick film only)			X			X
<b>Laser</b>						
- Expensive				X		X
- Large & bulky				X		X
- Thick & thin films				X		X
- Requires highly trained operator				X		X
- Requires complicated calculation tables				X		
- Requires filters on viewports				X		X
- Highly accurate when calibrated correctly				X		X
- Ex-situ				X		
<b>Ellipsometry</b>						
- Very expensive (~\$250K)				X	X	
- Bulky				X	X	
- Thick & thin films				X	X	
- Requires highly trained operator				X	X	
- Requires complicated calculation tables				X	X	
- Requires filters on viewports				X	X	
- Usually ex-situ				X	X	
<b>Quartz Crystal Microbalance (QCM)</b>						
- Inexpensive	X	X				
- In-situ, real-time	X	X				
- Temperature controlled (40-500C)	X					
- High temperature (>500C)	X					
- Highly accurate	X	X				
- "Bakeable" (no temp control)		X				