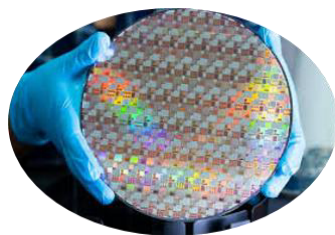


5.	Materials & processes: Thin films and semiconductor technology context (17)	
Target group	Pupils and/or teachers	
Age pupils	16–18	
Duration	60-120 minutes	
Introduction	Just by looking at the color of a thin film you will learn to judge on its thickness in the range of a few hundred nanometers.	
Materials and tools needed	• 5 wafers with strips of SiO₂: 100nm – 500nm (ranging from dark blue to red) • 1 clean wafer (for water experiment) • 1 wafer with structures (as example for real chips) • Spin dryer • bottle with water • small tub to collect water from dryer • extension cable (optional but helpful in class) 	
Instructions	How Does It Work? The portable spin dryer can be used as an alternative to a spin coater. When water is applied, it spreads on the wafer and when pushed outwards rings of different colors appear. Let's Build It! 1. Have a look at the water experiment 2. Have a look at the SiO₂-Wafer (1 wafer per team) Where do the colors come from? 3. Calculate the film thickness Use the equation for constructive interference ($d = \lambda / 2n$, blue strip: $\lambda = 400\text{nm}$, n of glass: 1.5 $\Rightarrow d = 133\text{nm}$) 4. Have a look at a measured spectrum Real thickness: 100nm	
Think like an engineer	Here you can add questions and texts that may trigger curiosity and trigger learning • Could there be a misinterpretation? Have a look at your hair: the human eye can resolve ca. 50μm, but using interferences, 500times thinner films can be defined. Still, similar to a rainbow the colors will repeat, so the thickness could be 100nm, 200nm, 300nm ... • Which examples do you know from daily life? E.g. Oil film on water • Which films could not be measured? E.g. metal	
Bonus Ideas	• What does make this analytical method so attractive? No sample preparation, no vacuum • Look at the wafer surface: the rainbow colors on the wafer, do they also result from the same effect? Not completely, typically, gratings are responsible for the color effects on chip surfaces	
Evidence	participant count; photo of setups if consented	