# Is the Future 2D?

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Semiconductor sales reached over $570 billion worldwide in 2022, a gigantic industry that keeps on growing with increasing demand for faster, more powerful, and smaller chips. However, as we keep scaling CMOS transistors, the silicon (Si) transistor will soon reach its physical limit, and there is a pressing need to find an alternative post-Si material to enable the continuation of Moore's Law. Furthermore, as we scale our interconnects and further constrain our metals, resistivity soars, there is a critical need to alleviate this resistance hit. As we search for this set of next generation materials, 2D materials such as Transition Metal Dichalcogenides (TMDs), at angstrom thicknesses, have been shown in academia to possess remarkable properties. Could 2D materials play a role in future electronic devices?

In this talk, I will present some of Intel's published research on 2D materials focusing on TMDs, from synthesis and characterization to innovative applications. How each year, we take a step further to attaining our vision of stacked 2D nanoribbons, while also continuously finding novel applications for 2D materials. I will demonstrate, that in Components Research at Intel, we are always looking for ways to improve future technologies and enable the continuation of Moore's Law.

## References

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[3] K. O'Brien et al., IEEE International Electron Devices Meeting (IEDM), 2021, pp. 7.1.1-7.1.4.
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## Figures

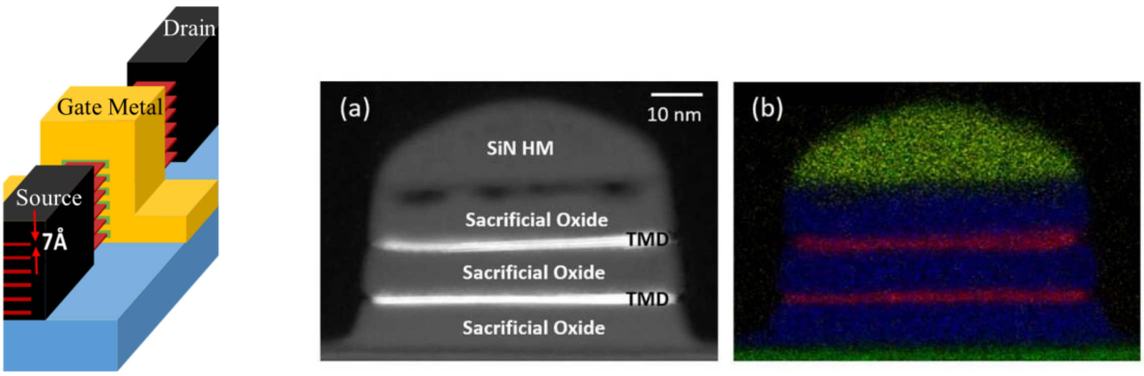


**Figure 1:** Schematic of Ultimate CMOS scaling with stacked 2D nano-sheets, followed by (a) TEM cross section of a two-layer TMD stacked nanoribbon structure showing 2 – 3 ML per nanoribbon, (b) TEM elemental mapping of stacked 2D nanoribbons.