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Deterministic and Scalable Growth of Electrically Self-Contacted 2D Materials ERIC STINAFF, SUDIKSHA KHADKA, MILES LINDQUIST, SHROUQ ALEITHAN, ARI BLUMER, THUSHAN WICKRAMASINGHE, RUHI THORAT, MARTIN KORDESCH, Ohio University — We will present a chemical vapor deposition process to selectively grow 2D materials in a deterministic manner around lithographically defined bulk metallic patterns which concurrently provide as-grown electrical contact to the material. With this process, monolayer films, with lateral extent of up to hundreds of microns are controllably grown on and around patterned regions of transition metals. The materials display strong luminescence, monolayer Raman signatures, and relatively large crystal domains. In addition to producing high optical quality monolayer material, the metallic patterns remain conductive providing as-grown metallic contacts to the material. The ability to controllably process 2D material into working devices with any scalability is still one of the largest impediments in the field. This is the first report of using bulk metallic patterns resulting in as-grown, self-forming, electrical contact to the monolayer material, providing a simple, scalable, and reproducible method for creating as-grown two-dimensional materials-based devices with broad implications for basic research and industrial applications.

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