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(19) **United States**(12) **Patent Application Publication**  
**GRAMMATIKOPOULOS et al.**(10) **Pub. No.: US 2023/0231118 A1**(43) **Pub. Date: Jul. 20, 2023**(54) **COMPOSITE NANOARCHITECTURE UNIT,  
MULTILAYER COMPOSITE, AND METHOD  
FOR MANUFACTURING COMPOSITE  
NANOARCHITECTURE UNIT****Related U.S. Application Data**

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**ABSTRACT**

A composite nanoarchitecture unit is disclosed. The unit comprises a columnar film grown on top of another layer where the columns touch each other at the top forming arches having optimized characteristics. This nanoarchitecture unit, called nano-vault, achieves high mechanical stability for films under strong and variable stress action.

