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(19) **United States**(12) **Patent Application Publication**
AI(10) **Pub. No.: US 2023/0231006 A1**(43) **Pub. Date: Jul. 20, 2023**(54) **SEMICONDUCTOR DEVICE WITH UNEVEN
ELECTRODE SURFACE AND METHOD FOR
FABRICATING THE SAME****H01G 4/012** (2006.01)(71) Applicant: **NANYA TECHNOLOGY
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(TW)(52) **U.S. Cl.**
CPC **H01L 28/92** (2013.01); **H01G 4/012**
(2013.01); **H01G 4/33** (2013.01)(72) Inventor: **TSU-CHIEH AI**, TAITUNG CITY
(TW)(57) **ABSTRACT**(21) Appl. No.: **18/124,763**(22) Filed: **Mar. 22, 2023****Related U.S. Application Data**(62) Division of application No. 17/484,485, filed on Sep.
24, 2021.**Publication Classification**(51) **Int. Cl.**
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The present application discloses a semiconductor device and a method for fabricating the semiconductor device. The semiconductor device includes a substrate; a bottom conductive layer positioned on the substrate; at least one bottom conductive protrusion positioned on the bottom conductive layer; an insulator layer positioned on the bottom conductive layer and the at least one bottom conductive protrusion; at least one bottom insulating protrusion protruding from the insulator layer towards the bottom conductive layer and adjacent to the at least one bottom conductive protrusion; and a top conductive layer positioned on the insulator layer. The bottom conductive layer, the at least one bottom conductive protrusion, the insulator layer, the at least one bottom insulating protrusion, and the top conductive layer together configure a capacitor structure.

