

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2024/0213336 A1 Li et al.

Jun. 27, 2024 (43) **Pub. Date:**

(54) GATE-ALL-AROUND TRANSISTOR, METHOD FOR MANUFACTURING THE SAME, AND SEMICONDUCTOR DEVICE

(71) Applicant: INSTITUTE OF MICROELECTRONICS, CHINESE **ACADEMY OF SCIENCES**, Beijing (CN)

Inventors: Yongliang Li, Beijing (CN); Fei Zhao, Beijing (CN)

Appl. No.: 18/522,198 (21)

(22)Filed: Nov. 28, 2023

(30)Foreign Application Priority Data

Dec. 21, 2022 (CN) 202211652172.8

Publication Classification

(51) Int. Cl. H01L 29/417 (2006.01)H01L 29/06 (2006.01)H01L 29/40 (2006.01)H01L 29/423 (2006.01)

H01L 29/66 (2006.01)(2006.01)H01L 29/775

U.S. Cl.

CPC H01L 29/41733 (2013.01); H01L 29/0673 (2013.01); H01L 29/401 (2013.01); H01L 29/42392 (2013.01); H01L 29/66439 (2013.01); H01L 29/66545 (2013.01); H01L 29/775 (2013.01)

ABSTRACT (57)

A gate-all-around transistor is provided, including: a semiconductor substrate, a nanostructure, a gate stack structure and a gate length defining structure. In a length direction of the nanostructure, each layer of nanostructure includes a source region, a drain region, and a channel region between the two. Materials of the source region and drain region include a first metal semiconductor compound. The gate stack structure surrounds the channel region. In a length direction of the gate stack structure, a sidewall of the gate stack structure is recessed relative to a sidewall of the channel region to form a recess, and the gate length defining structure is filled in the recess. The gate length defining structure is made of a second metal semiconductor compound, and a semiconductor material for making the second metal semiconductor compound is different from that for making the first metal semiconductor compound.

