NANOFAB FUTURE ELECTRONICS

CNST Center for Nanoscale Science & Technology

Improving Silicon Carbide Transistor Performance

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GOAL

To improve electron mobility at the SiO_2/SiC interfaces in high power, high temperature SiC-based metal–oxide–semiconductor field-effect transistor (MOSFET) devices by decreasing the number of interfacial traps.

KEY ACCOMPLISHMENTS

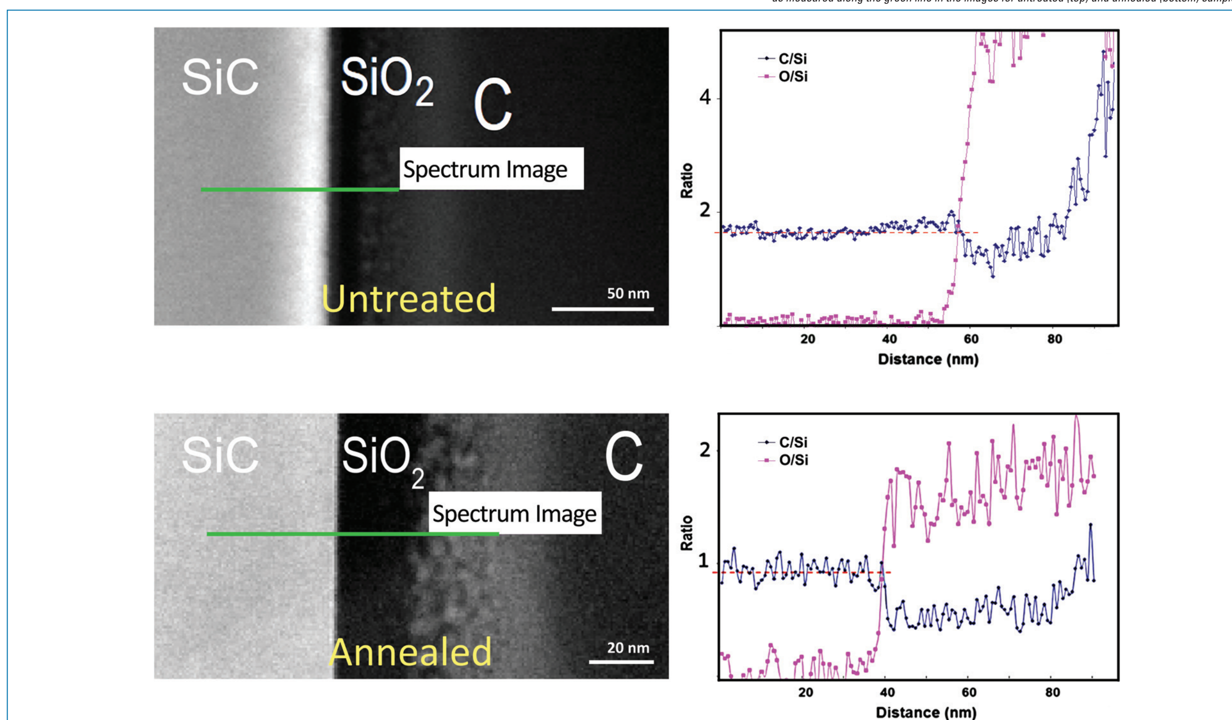
Reduced the carbon and oxygen diffusion between the SiC substrate and the SiO_2 layer by annealing the substrate in heated nitric oxide.

Improved the electron mobility at the SiO_2/SiC interfaces.

KEY NANOFAB PROCESS

Focused ion beam preparation of thin samples from MOSFETs processed under varying conditions.

Dark field scanning TEM images of the SiC/SiO_2 interface and corresponding C/Si and O/Si ratios as measured along the green line in the images for untreated (top) and annealed (bottom) samples.



REFERENCE

Relationship between 4H-SiC/SiO_2 transition layer thickness and mobility, T. L. Biggerstaff, J. Reynolds, T. Zheleva, A. Lelis, D. Habersat, S. Haney, S.-H. Ryu, A. Agarwal, and G. Duscher, *Applied Physics Letters* **95**, (2009).