

GOLD DECORATED GALIUM OXIDE NANOWIRES FOR MULTIFUNCTIONAL APPLICATIONS

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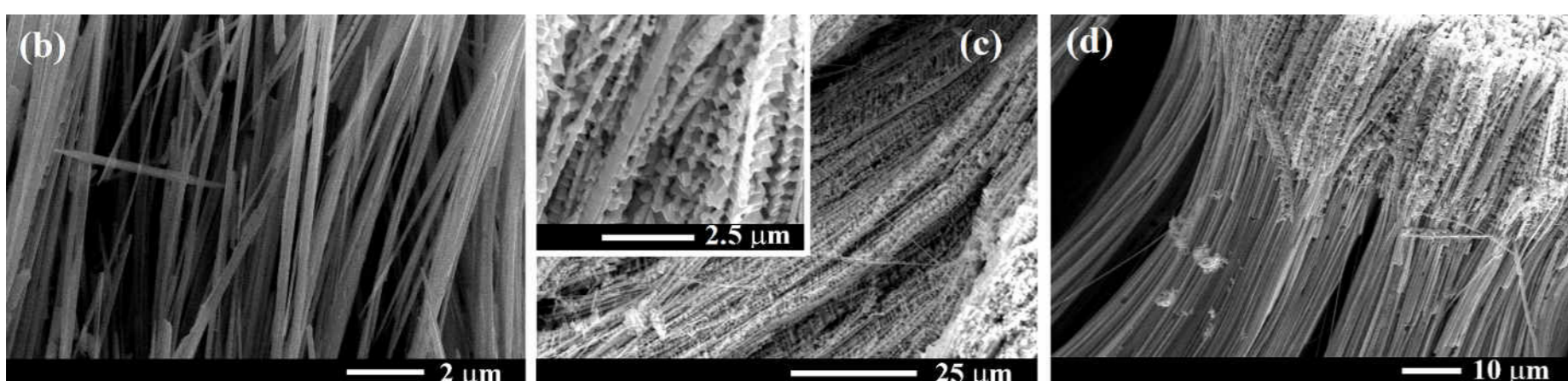
A three-step fabrication process for the production of hybrid nanostructures consisting of Ga₂O₃ nanowires decorated with gold nanodots on GaAs substrates is reported. The process involves electrochemical etching of GaAs substrates in the first technological step to produce GaAs nanowires with good electrical conductivity [1,2], followed by electrochemical deposition of gold nanodots on these nanowires in the second step [3]. Subsequently, thermal treatment in argon atmosphere with a small amount of oxygen is employed in the third technological step to selectively convert GaAs nanowires into Ga₂O₃ nanowires covered by gold nanodots. Moreover, it was demonstrated that this approach offers a controlled fabrication route, enabling precise tuning of nanowire dimensions, their crystallographic orientation, as well as modulation of their diameter [4]. Characterization techniques such as SEM, EDX and XRD validated the morphology and structure of the produced Ga₂O₃ nanowires. The fabricated hybrid nanostructures exhibit promising properties for various applications in sensing, photodetection, and catalysis, with potential for further optimization through parameter adjustments and functionalization for reaching tailored properties.

I-step of fabrication process flow

The semiconductor nanowires are prepared by a cost-effective electrochemical etching of n-GaAs substrates.

A selective modulation of nanowires via anodization at two different applied potentials is demonstrated.

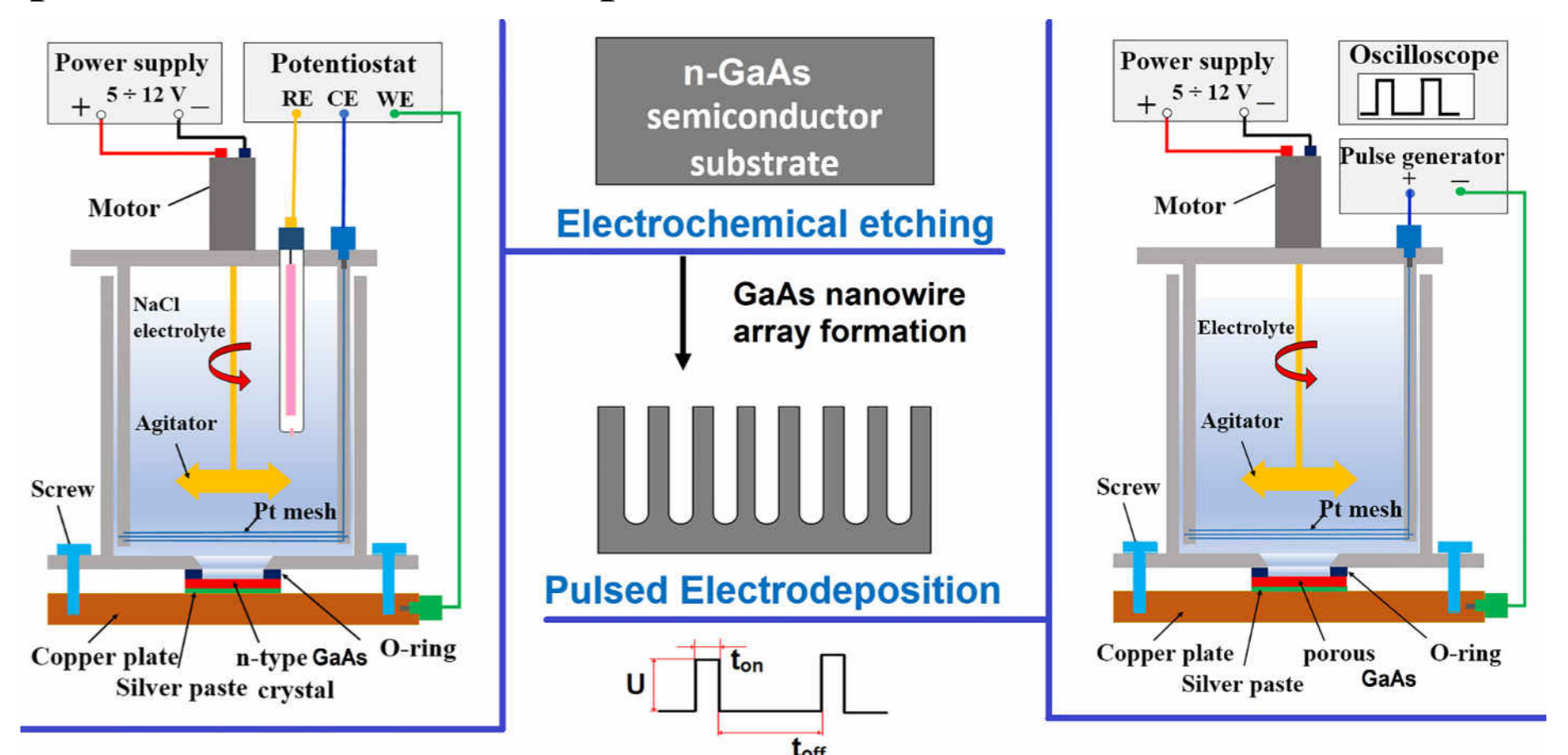
- smooth wall GaAs nanowires at 4 V;
- 3D modulated GaAs nanowires obtained at 4, 7 V.



GaAs nanowires with smooth or modulated walls

II-step of fabrication process flow

Functionalization of GaAs nanowires array with Au nanodots via pulsed electrochemical deposition.



References

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Ref. 1



Ref. 2



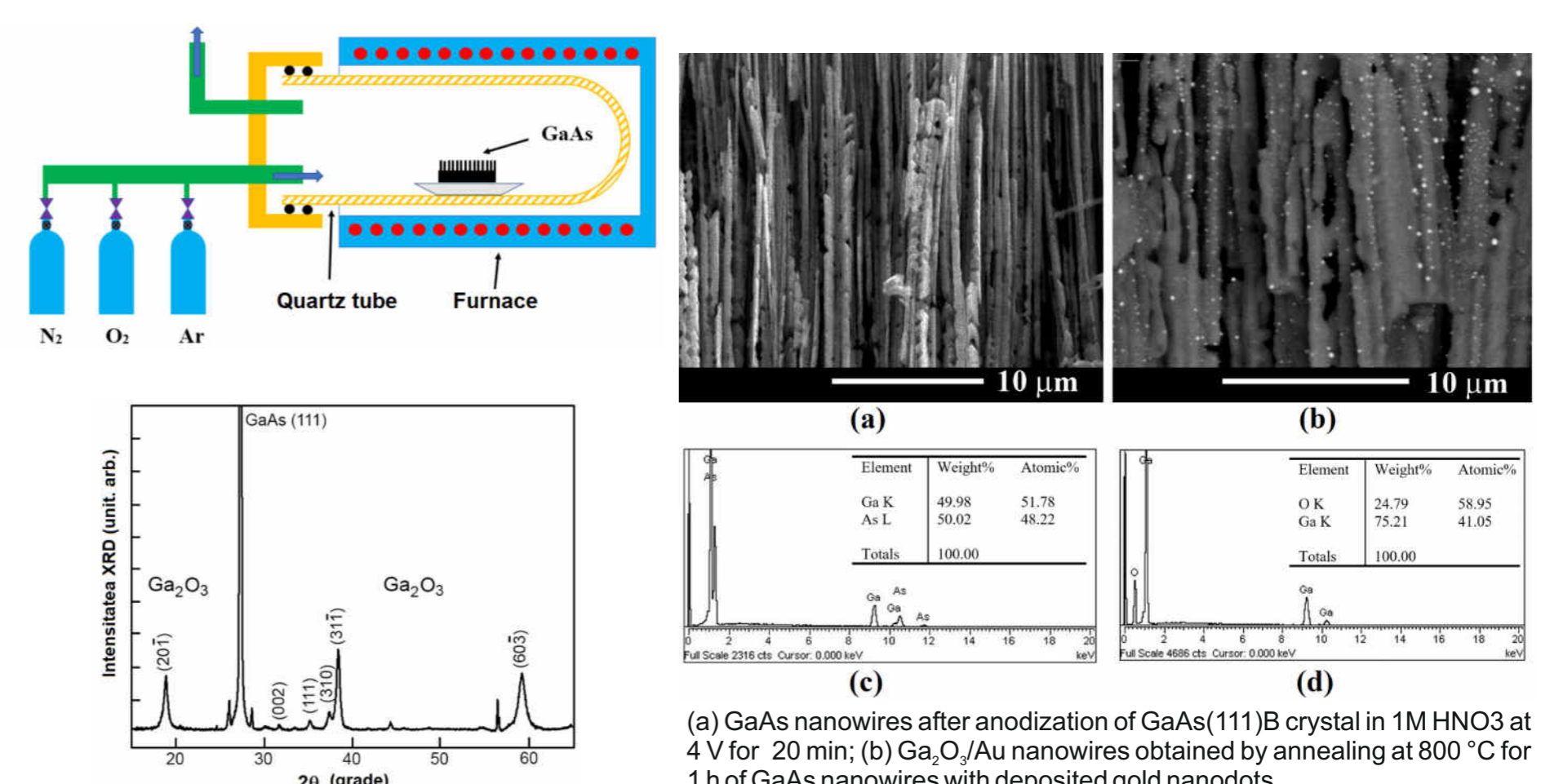
Ref. 3



Ref. 4

III-step of fabrication process flow

Transformation of GaAs nanowires with Au nanodots in Ga₂O₃ nanowires via thermal treatment.



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