

CHALLENGE

Project ID: 720827

Funded under:

H2020-EU.2.1.3. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Advanced materials

3C-SiC Hetero-epitaxiALLY grown on silicon complianceE substrates and 3C-SiC substrates for sustaiNable wide-band-Gap powEr devices

From 2017-01-01 **to** 2020-12-31, ongoing project

Project details

<p>Total cost:</p> <p>EUR 8 048 322,50</p> <p>EU contribution:</p> <p>EUR 7 997 822,50</p> <p>Coordinated in:</p> <p>Italy</p>	<p>Topic(s):</p> <p>NMBP-02-2016 - Advanced Materials for Power Electronics based on wide bandgap semiconductor devices technology</p> <p>Call for proposal:</p> <p>H2020-NMBP-2016-two-stage See other projects for this call</p> <p>Funding scheme:</p> <p>RIA - Research and Innovation action</p>
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Objective

Silicon carbide presents a high breakdown field (2-4 MV/cm) and a high energy band gap (2.3-3.2 eV), largely higher than for silicon. Within this frame, the cubic polytype of SiC (3C-SiC) is the only one that can be grown on a host substrate with the huge opportunity to grow only the silicon carbide thickness required for the targeted application. The possible growth on silicon substrate has remained for long period a real advantage in terms of scalability regarding the reduced diameter of hexagonal SiC wafer commercially available. Even the relatively narrow band-gap of 3C-SiC (2.3eV), which is often regarded as detrimental in comparison with other polytypes, can in fact be an advantage. The lowering of the conduction band minimum brings about a reduced density of states at the SiO₂/3C-SiC interface and MOSFET on 3C-SiC has demonstrated the highest channel mobility of above 300 cm²/(Vxs) ever achieved on SiC crystals, prompting a remarkable reduction in the power consumption of these power switching devices. The electrical activity of extended defects in 3C SiC is a major concern for electronic device functioning. To achieve viable commercial yields the mechanisms of defects must be understood and methods for their reduction developed. In this project new approaches for the reduction of defects will be used, working on new compliance substrates that can help to reduce the stress and the defect density at the same time. This growth process will be driven by numerical simulations of the growth and simulations of the stress reduction. The structure of the final devices will be simulated using the appropriated numerical tools where new numerical model will be introduced to take into account the properties of the new material. Thanks to these simulations tools and the new material with low defect density, several devices that can work at high power and with low power consumption will be realized inside the project.

Coordinator

CONSIGLIO NAZIONALE DELLE RICERCHE
PIAZZALE ALDO MORO 7
00185 ROMA
Italy

Italy

EU contribution: EUR 1 427 812,50

Activity type: Research Organisations

Participants

FRIEDRICH-ALEXANDER-UNIVERSITAET ERLANGEN NUERNBERG
Schlossplatz 4
91054 ERLANGEN
Germany

Germany

EU contribution: EUR 389 875

Activity type: Higher or Secondary Education Establishments

L.P.E. SPA
VIA DEI GIOVI 7
20100 BARANZATE MILANO
Italy

Italy

EU contribution: EUR 675 625

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

NOVASiC SA
SAVOIE TECHNOLAC ARCHE BAT. 4
73375 LE BOURGET DU LAC
France

France

EU contribution: EUR 581 146,25

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

ANVIL SEMICONDUCTORS LTD
WINDMILL INDUSTRIAL ESTATE, BIRMINGHAM ROAD, ALLESLEY
CV5 9QE COVENTRY
United Kingdom

United Kingdom

EU contribution: EUR 584 375

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

ASCATRON AB
ISAFJORDSGATAN 22 ELECTRUM 207
164 40 KISTA
Sweden

Sweden

EU contribution: EUR 880 000

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

UNIVERSITA' DEGLI STUDI DI MILANO-BICOCCA
PIAZZA DELL'ATENEIO NUOVO 1
20126 MILANO
Italy

Italy

EU contribution: EUR 349 250

Activity type: Higher or Secondary Education Establishments

SILVACO EUROPE LTD
SILVACO TECHNOLOGY CENTRE COMPASS POINT
PE27 5JL ST IVES
United Kingdom

United Kingdom

EU contribution: EUR 253 515

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

MOVERIM CONSULTING SPRL
SQUARE AMBIOREX 32
1000 BRUXELLES
Belgium

Belgium

EU contribution: EUR 309 298,75

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

ION BEAM SERVICES
RUE GASTON IMBERT PROLONGEE
13790 ROUSSET
France

France

EU contribution: EUR 639 125

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

Linkopings Universitet
Campus Valla
58183 Linkoping
Sweden

Sweden

EU contribution: EUR 661 041,25

Activity type: Higher or Secondary Education Establishments

THE UNIVERSITY OF WARWICK
Kirby Corner Road - University House
CV4 8UW COVENTRY
United Kingdom

United Kingdom

EU contribution: EUR 783 425

Activity type: Higher or Secondary Education Establishments

STMICROELECTRONICS SRL
VIA C.OLIVETTI 2
20864 AGRATE BRIANZA
Italy

Italy

EU contribution: EUR 463 333,75

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

CUSIC INC.
SENTOKAIKAN BLD 2-2-10 CHUO AOBA KU SANDAI SHI MIY
980 0021 SENDAI
Japan

Japan

EU contribution: EUR 0

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)

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