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# FROM LABORATORY PROOF-OF-CONCEPT TO ONE INDUSTRIAL PROTOTYPE: HOW TO CLOSE THE ITALIAN GAP

UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA

PoliS Lombardia

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# Outline

- The Italian paradox: great science, weak innovation.
- Prototype of innovation chain: the mouse of Steve Jobs.
- Why the chain is actually a loop.
- One example in Materials Science in the CHALLENGE industrial project of Horizon 2020.


- The hard step between proof-of-concept and industrial prototype.

# CARIPLO Foundation survey on hundreds funded projects in Materials Science: the Italian paradox

- A great throuput of high-impact publications
- A significant number of patent applications
- A very limited number of granted patents, finally transferred to industrial companies
- Very, very few start-up companies

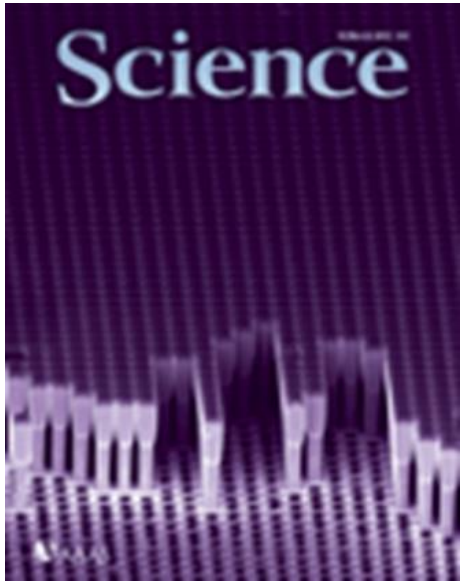
# Basic question

## Is the Italian Applied Research in Materials Science ill-oriented for technology transfer?

My experience:

Three-dimensional heteroepitaxy on patterned substrates, nanostructures such as dots and nanowires.

Start-up company funded by VC and industrial partners PILEGROWTH TECH



# The mouse of Steve Jobs (1979)

D. Engelbart, one idea at Stanford

Xerox prototype at Palo Alto PARC

Apple device of Steve Jobs

# Linear «naive» model of the chain

Laboratory proof – of - concept

Here, most of no-profit fundings drop

Patenting: when is the right time to do it ?

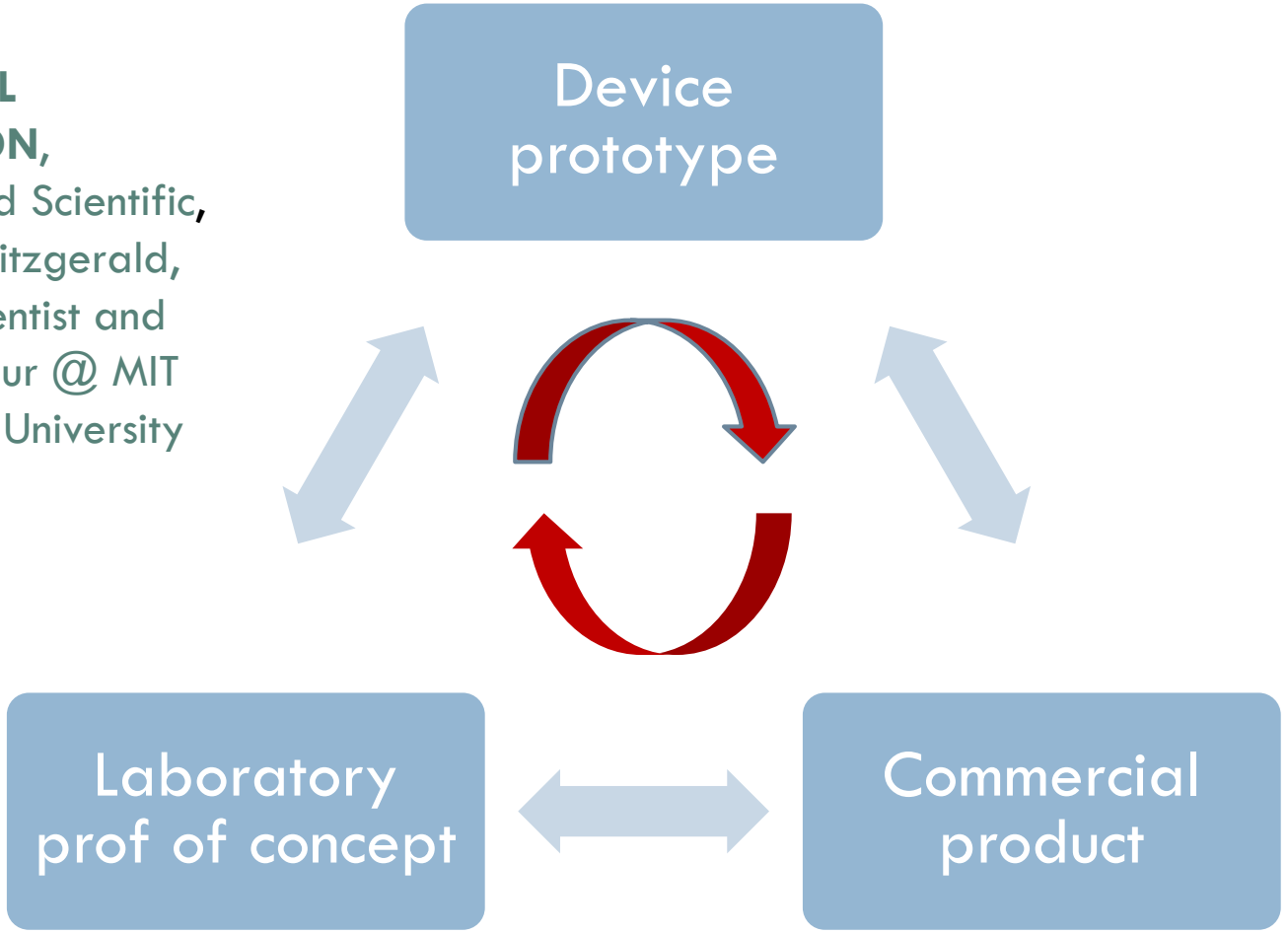
Device prototype

Here, financial or industrial investors get in

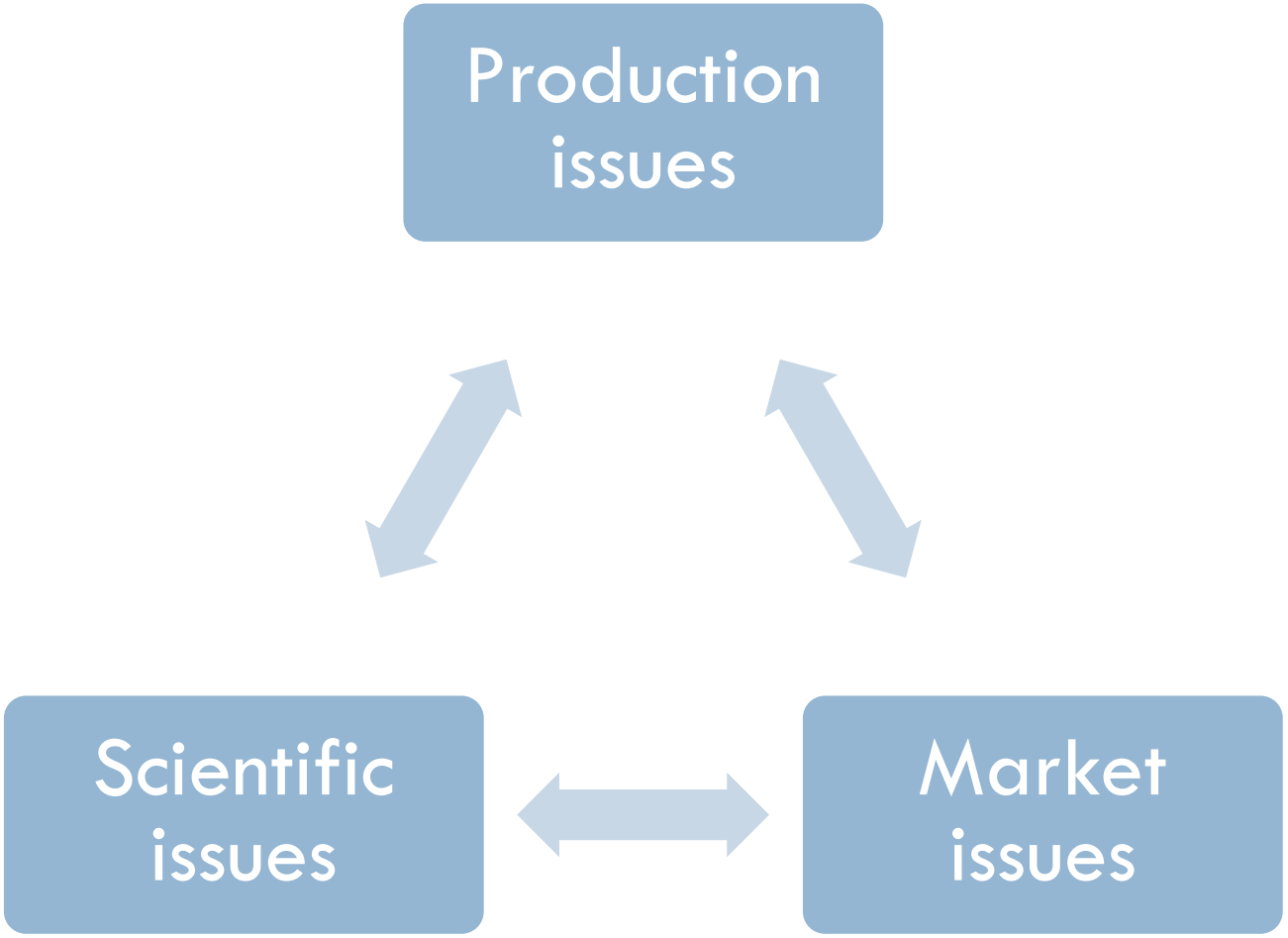
Commercial product

# The innovation loop 1

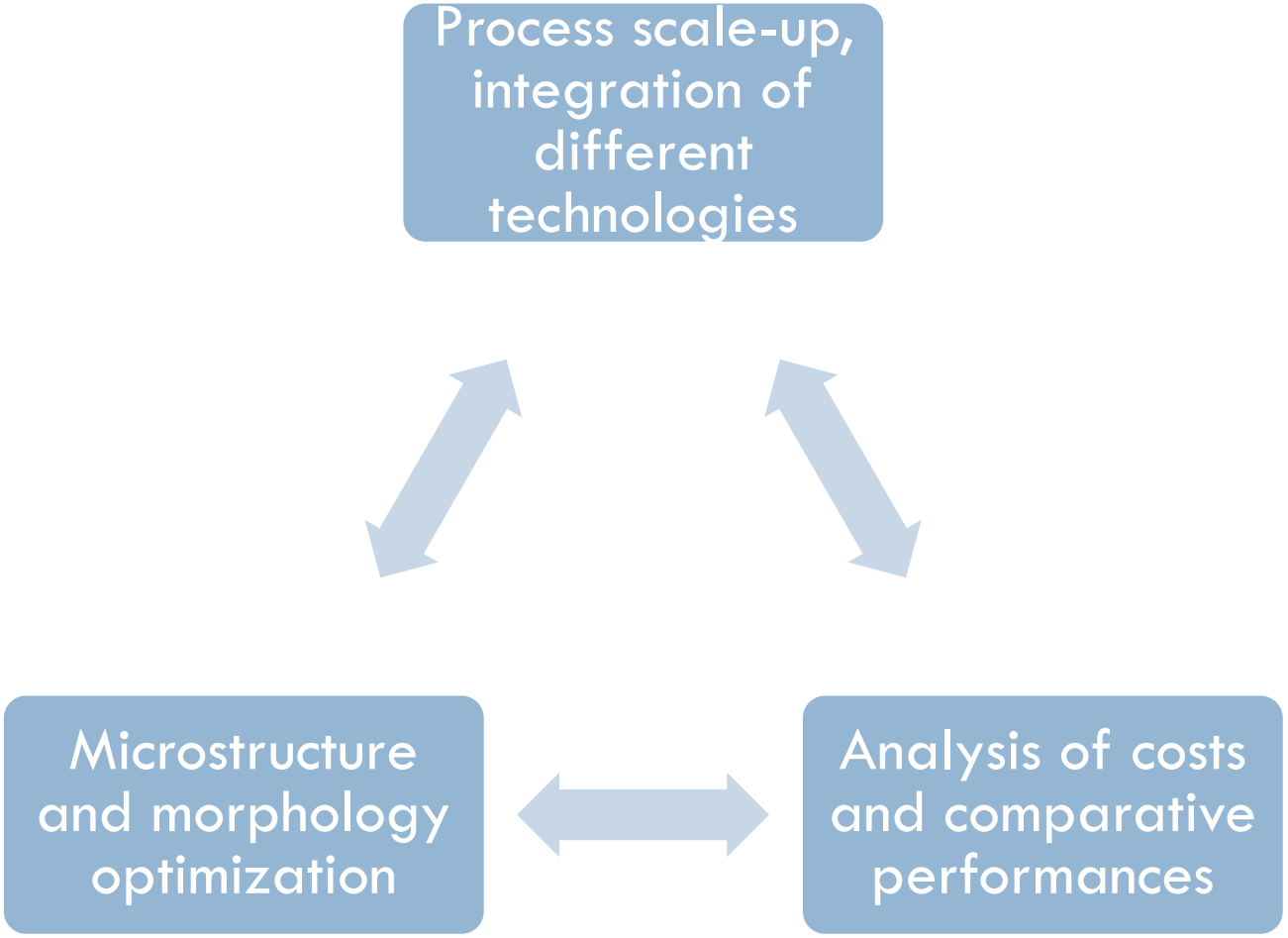
**INSIDE REAL INNOVATION,**
2010, World Scientific,
by Eugene Fitzgerald,
material scientist and
technopreneur @ MIT
and Cornell University



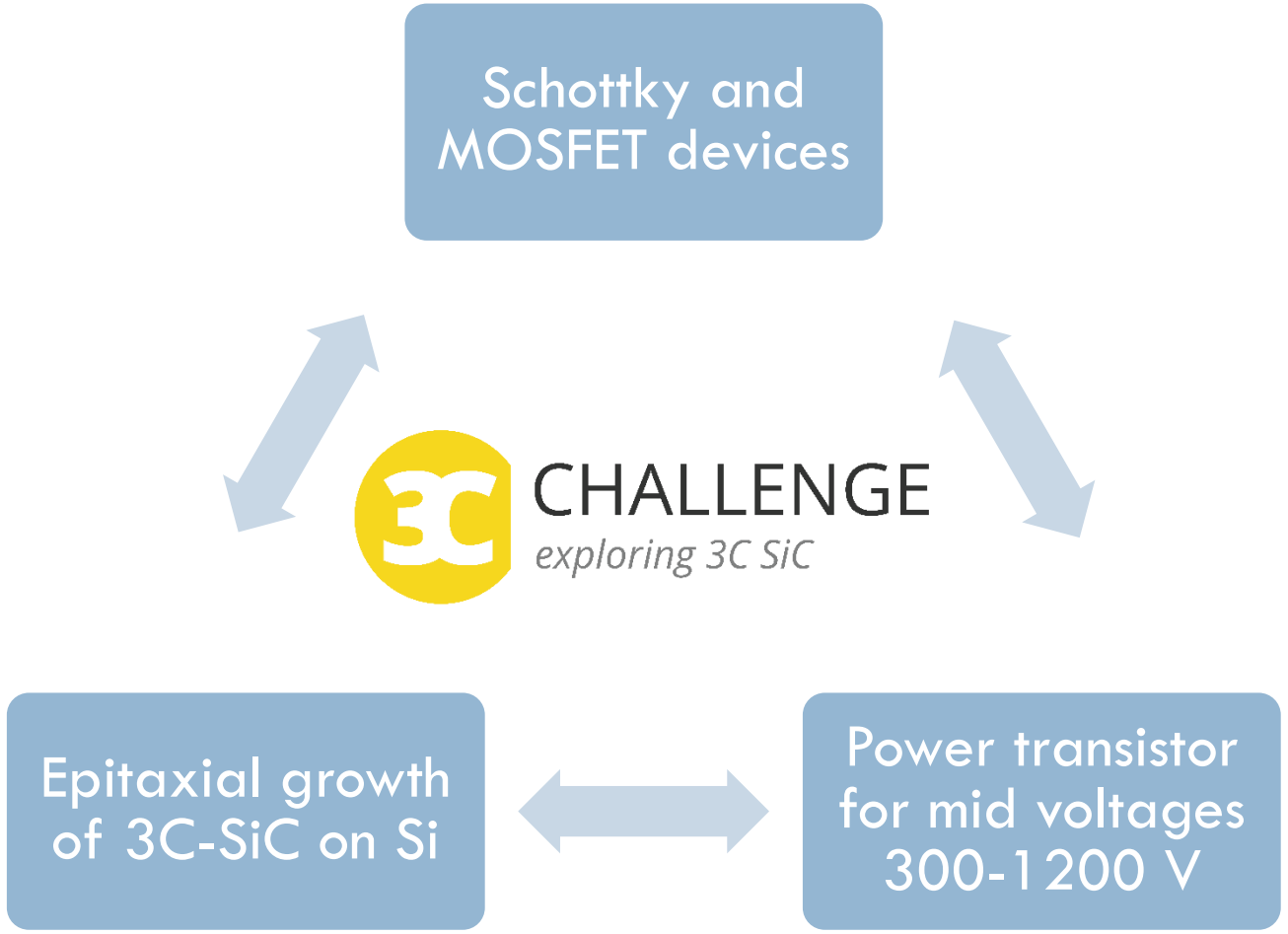
# The innovation loop 2



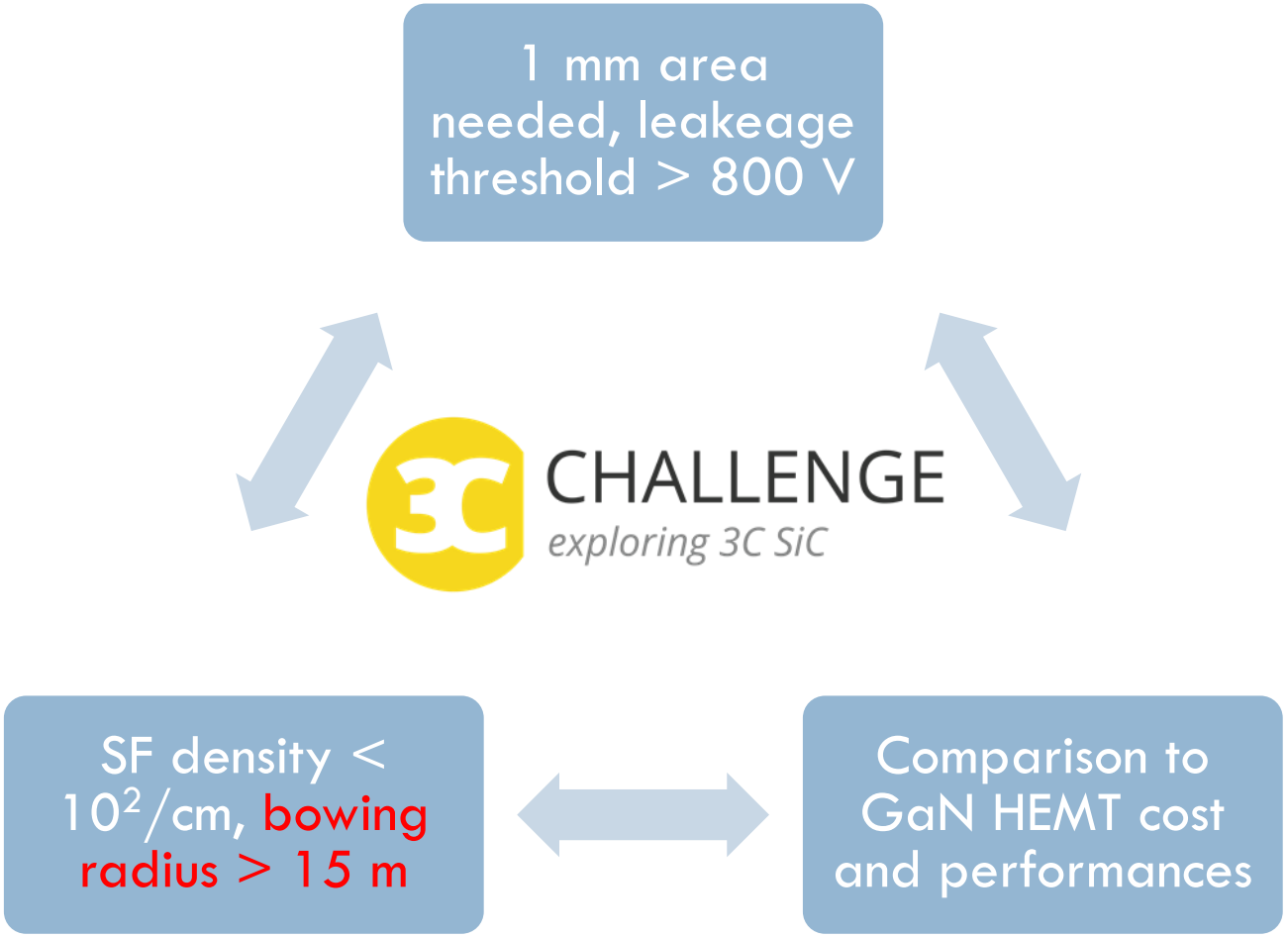
# The innovation loop 3



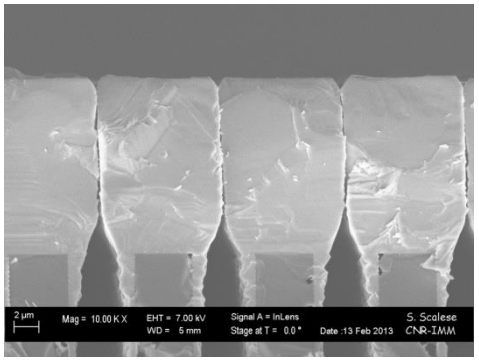
# 3C-SiC for power electronics 1

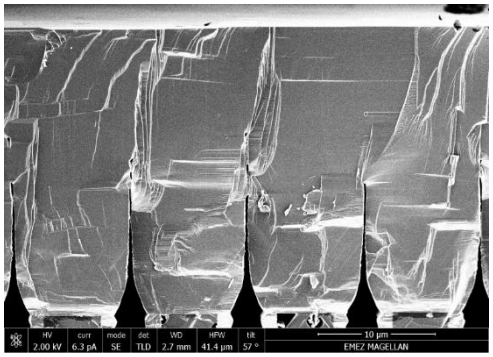


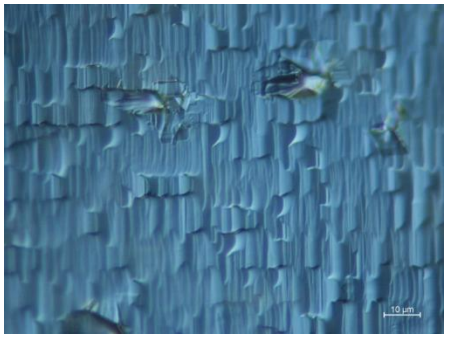
# 3C-SiC for power electronics 2



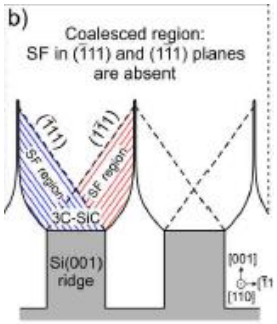
# Forming a suspended layer on Si(001)

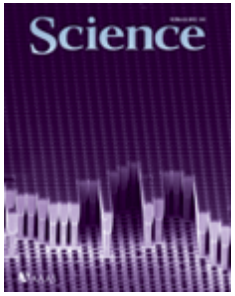


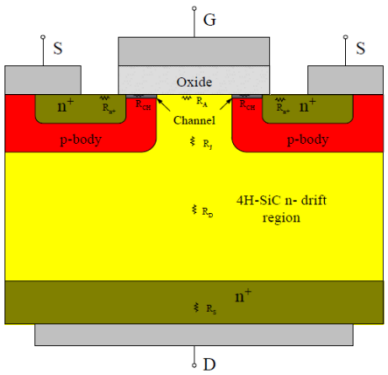




Too rough and SF defected surface

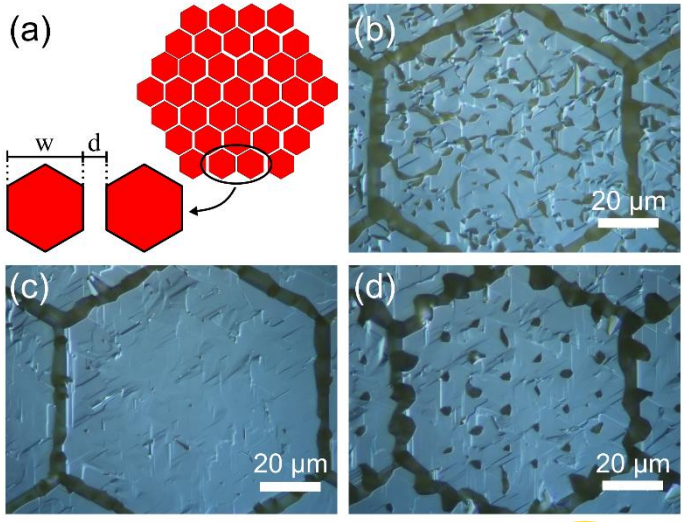


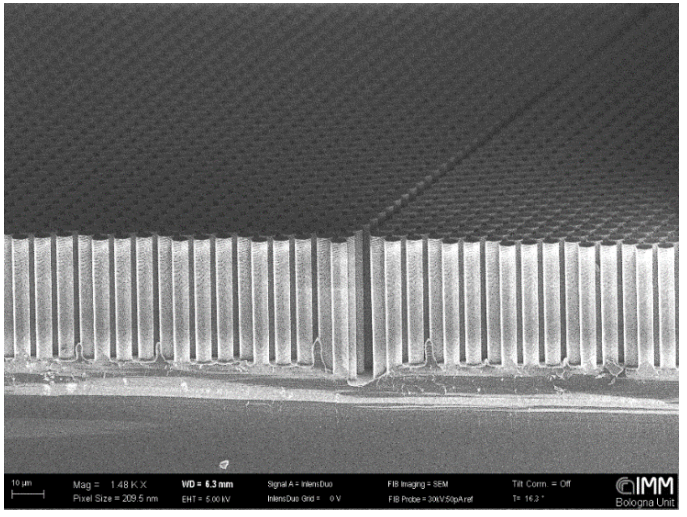



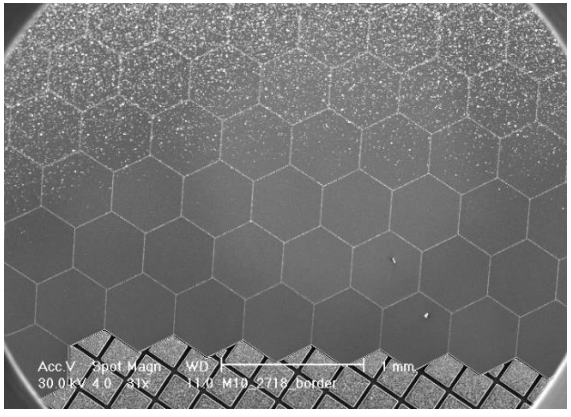

CHALLENGE
exploring 3C SiC

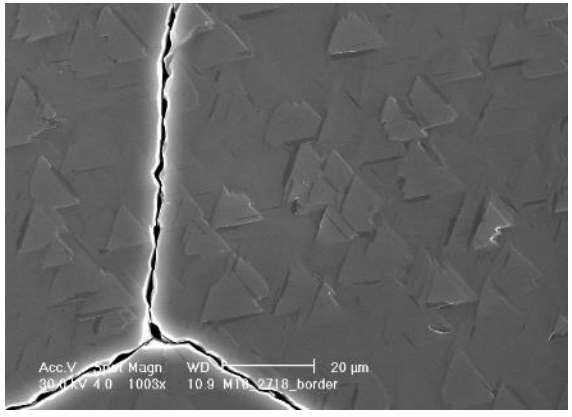
# Turning to Si(111): the innovation loop

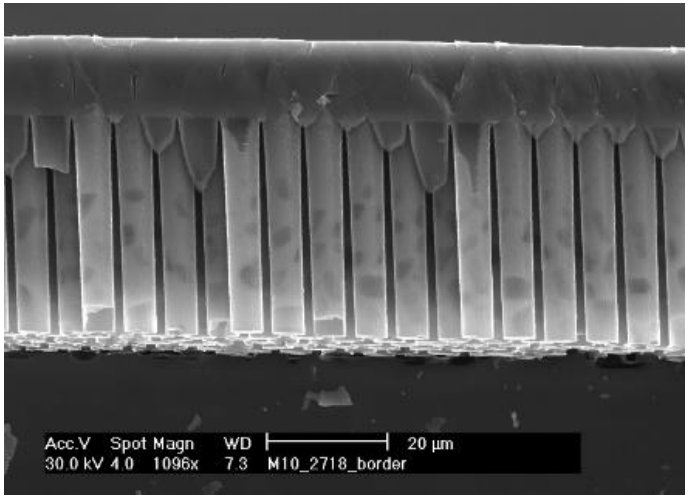


CHALLENGE
*exploring 3C SiC*



# The role of Horizon 2020 projects

- Linking academic labs and industrial partners, particularly in the calls «Strengthening the Industrial Leadership»
- Setting a series of deliverables, finally close to a device prototype.
- They lack of:
  - a product development manager
  - a really close interaction between partners
  - a innovation-loop concept: they are linear

# In-depth analysis for the Italian case 1

Laboratory proof-of-concept

Manpower: scientists, OK

Facilities1: material syntesis and characterization. OK

Facilities2: functional concept design, realization, and testing. PROBLEM: Academia lacks integrated labs

# In-depth analysis for the Italian case 2

Device prototype

Manpower: product development technologists. PROBLEM: who?

Facilities1: integration of different technologies/materials. PBL: where?

Facilities2: industrial production of FEW custom-made pieces. PBL: $ support

# In-depth analysis 3

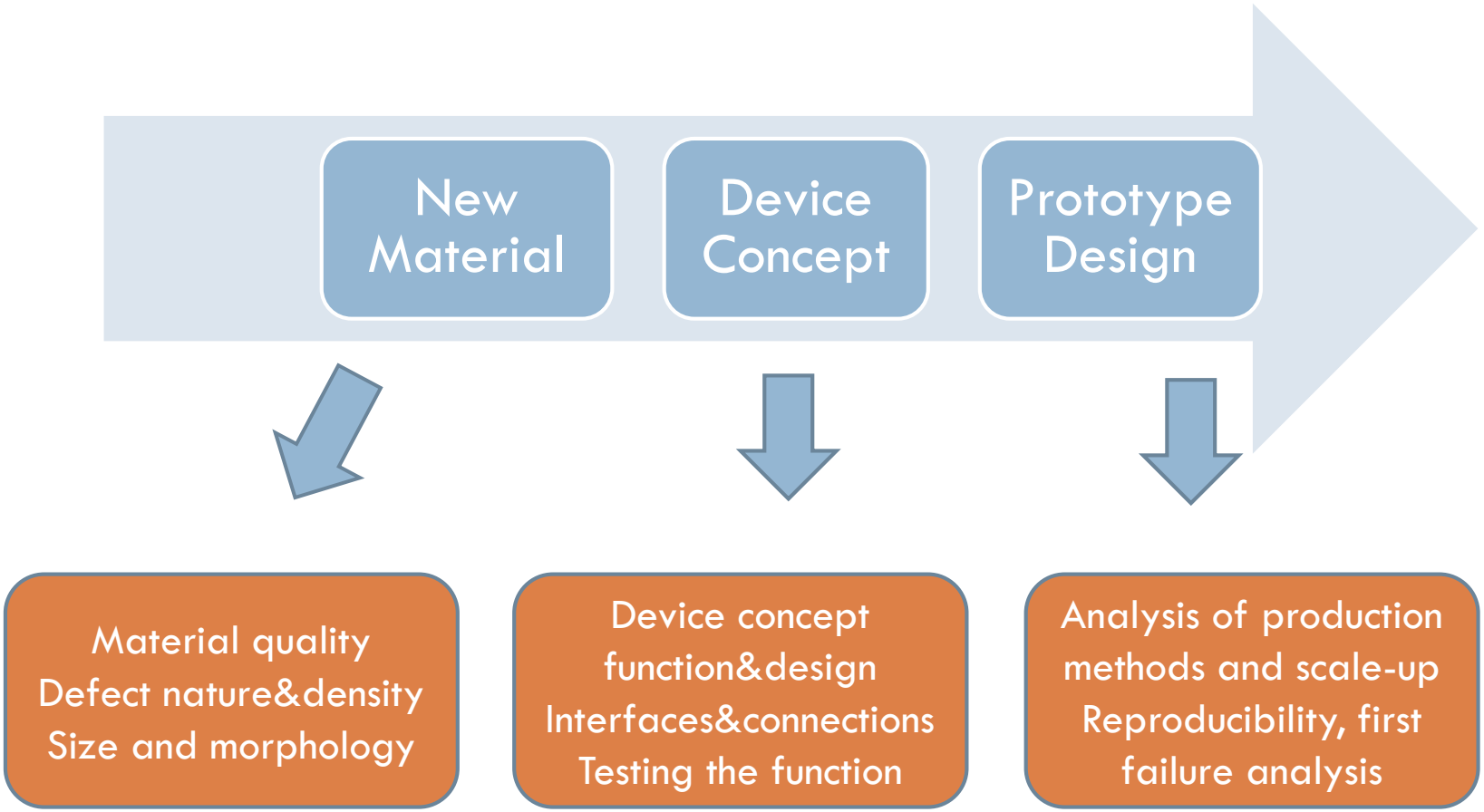
Commercial product

Manpower: product development managers. OK, but few

Facilities: in-house development units. PBL: mostly assembly of third party supply; all production line fully booked

Financial support: patent extensions and mantainance; product optimization costs. PBL: not suited for a loop. GENERAL PROBLEM: too small and targeted companies

# Back to materials: the gap in the labs



# Conclusions on the innovation loop

- We need more integrated labs, where a device concept based on a new material can be tested

- We need prototyping areas, where the device concept is developed into a real prototype: (different) industrial partners are mandatory with a (different) collaboration attitude and facilities. Public and/or private funded? No Venture usually comes in at this stage

- We need company size and structure able to sustain a (usually long) innovation loop, not a simply linear one.