



## **Valorizzazione dei sottoprodotti della vinificazione e scarti alimentari: nuovi materiali per l'industria**

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Grandi quantità di scarti e sottoprodotti lungo la filiera agro-alimentare



Gli scarti sono una fonte di molecole che possono essere usate come materie prime in diversi settori industriali



# Interesse alla valorizzazione degli scarti agroalimentari

**WasToy-PRIN2022-MIUR**



**Sea Wine -MASAF**



**Canapa Campana in Fibra - REGIONE CAMPANIA**



**Bio-Phenom - HORIZON RIA-  
 COMMISSIONE EUROPEA**



**Phenocycles- STAFF EXCHANGE-  
 MSCA- COMMISSIONE EUROPEA**

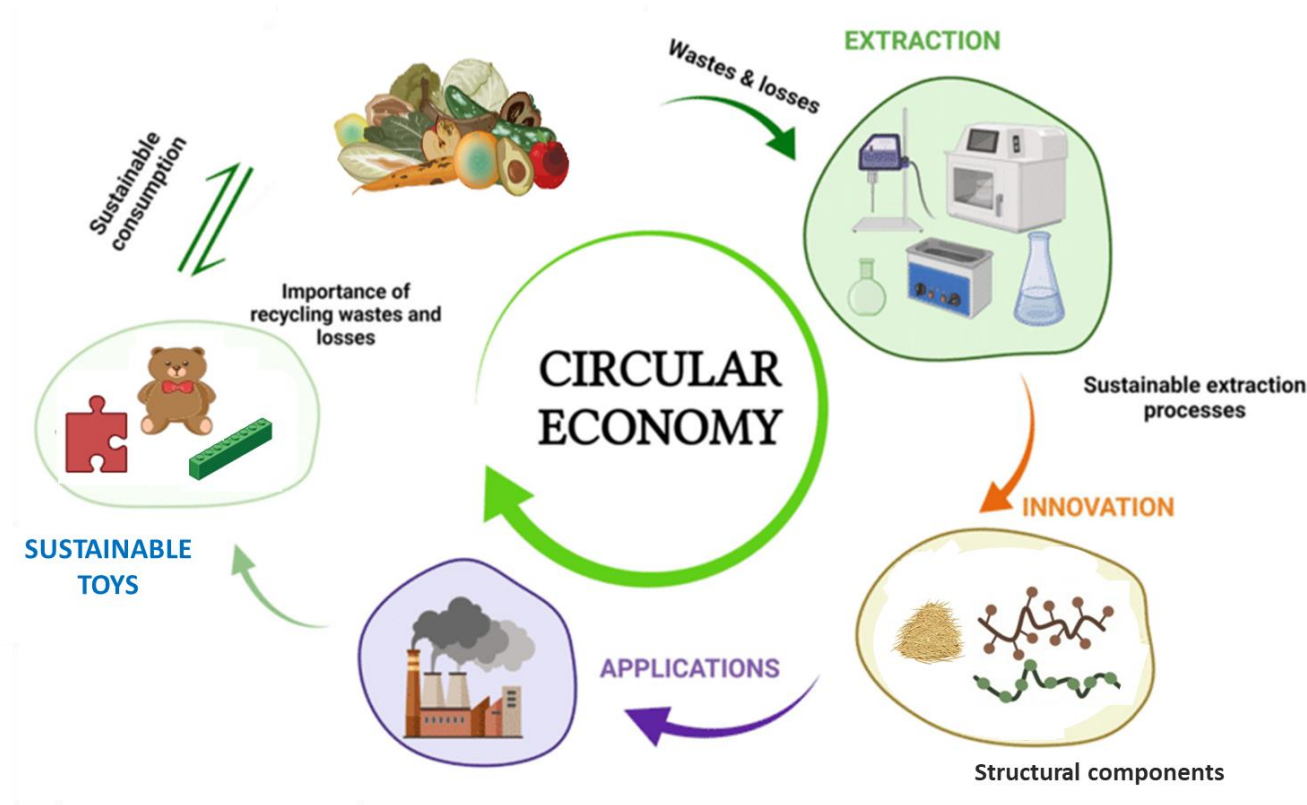






## WASTOY: was WASTE, will be TOY

*Combining design and material science to develop made in Italy circular toys upcycling organic waste through a bioeconomy approach - PRIN2022*



**POLITECNICO MILANO 1863**



FONDAZIONE IDIS  
**CITTÀ DELLA SCIENZA**



**MUBA**  
 MUSEO DEI BAMBINI MILANO



UNIVERSITÀ DEGLI STUDI DI NAPOLI  
**FEDERICO II**



## WP1 INVESTIGATION and MAPPING of the AGRI-FOOD WASTE STREAMS and the PRODUCTION ENTITIES



## WP3 FROM MATERIALS TO TOYS



Realization of design concepts- Materials Driven Design

## WP5 PROJECT MANAGEMENT, DISSEMINATION and CONSOLIDATION



## WP2 EXPERIMENTATION & MATERIAL DESIGN



Material development & characterization

Sustainable extraction and process procedures



## WP4 VALIDATION

- Design
- Sustainability
- Productive entities (toys companies)
- Final users (children)



# Bioraffineria

Ridotte emissioni di gas inquinanti rispetto all'impiego di fonti energetiche tradizionali

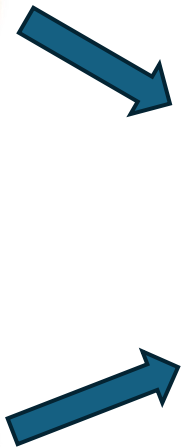
## INPUT



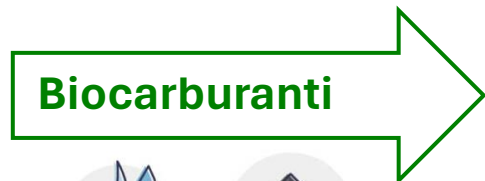
Agricoltura



Scarti agroalimentari



BIOCHAR



BIOGAS

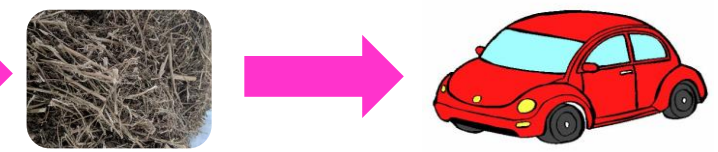


BIO-OIL





**Canapa Campana in Fibra**



Hemp fiber waste



Pyrolysis @ 1000°C



Biochar

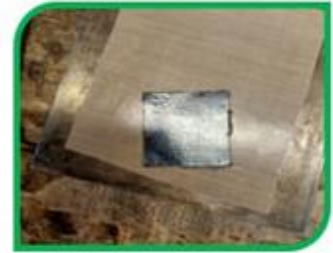


Ethylene-Vinyl Acetate

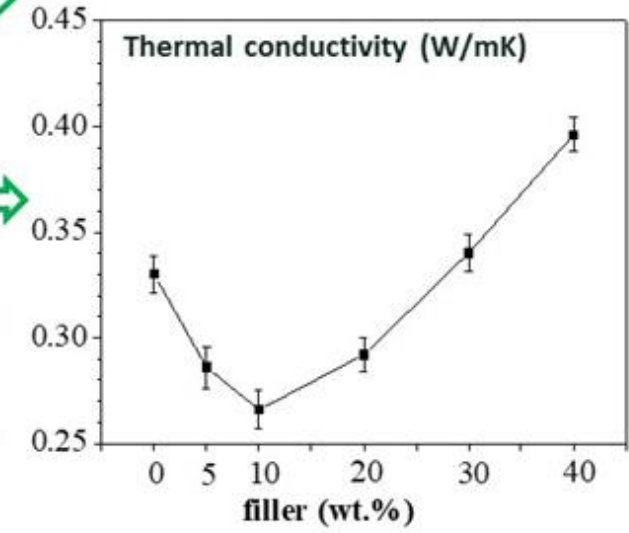
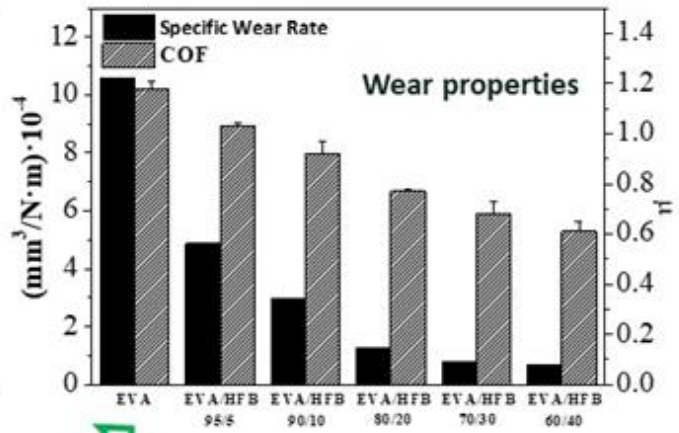
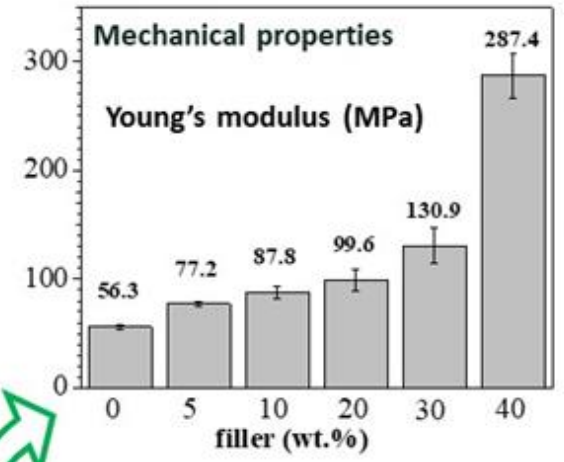
Melt Mixing by Brabender



140 °C; t= 5min  
at 70 rpm



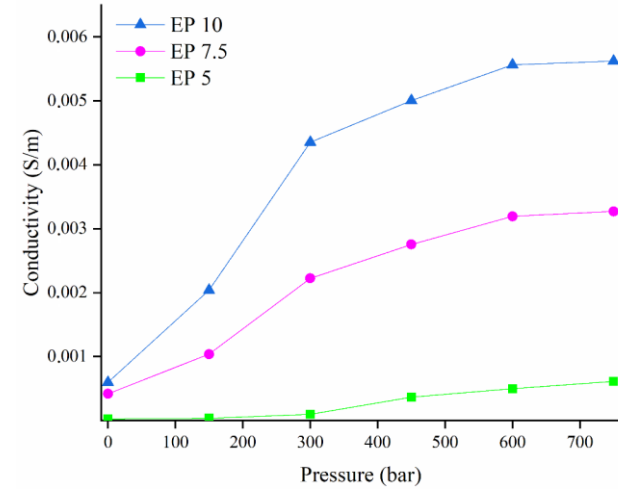
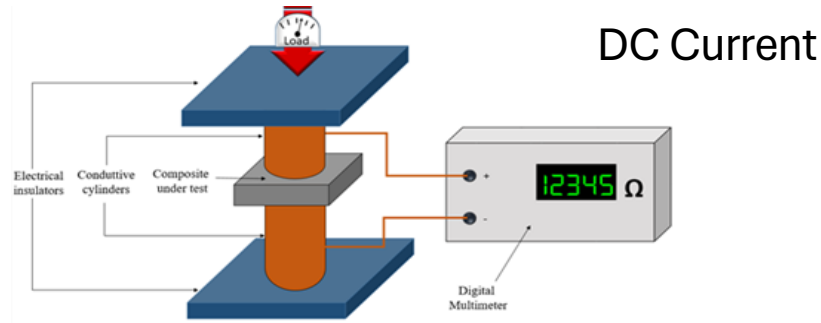
Testing Specimens obtained by compression molding



**Canapa Campana in Fibra**

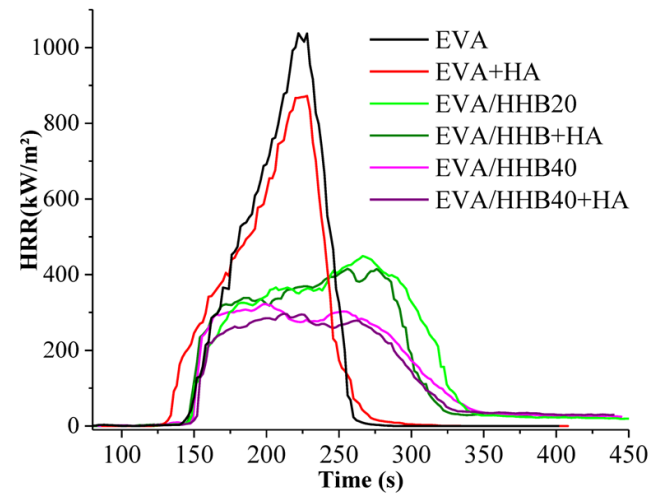
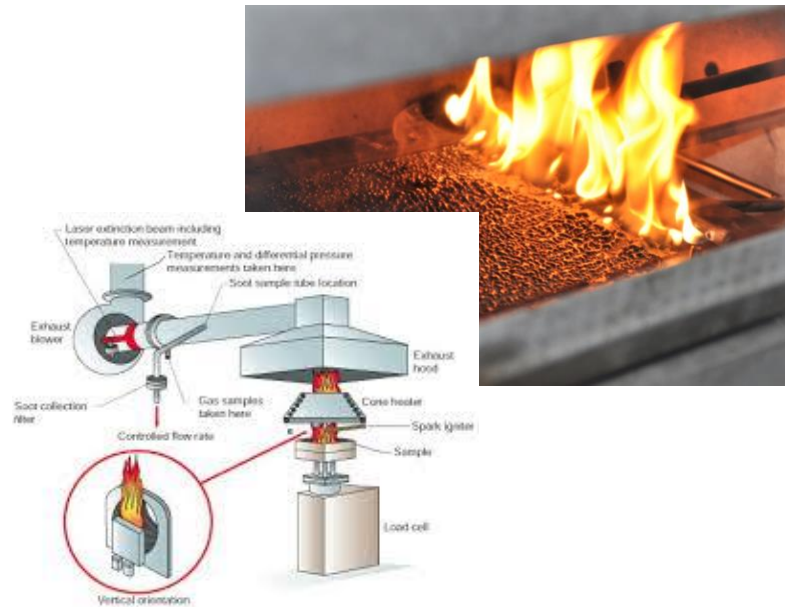


**Biochar migliora la conducibilità elettrica**



**wt% di fibra canapa**

**Biochar migliora la resistenza alla fiamma**

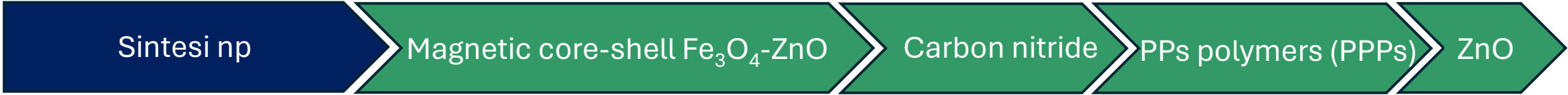


**Anche in Bio-Phenom**

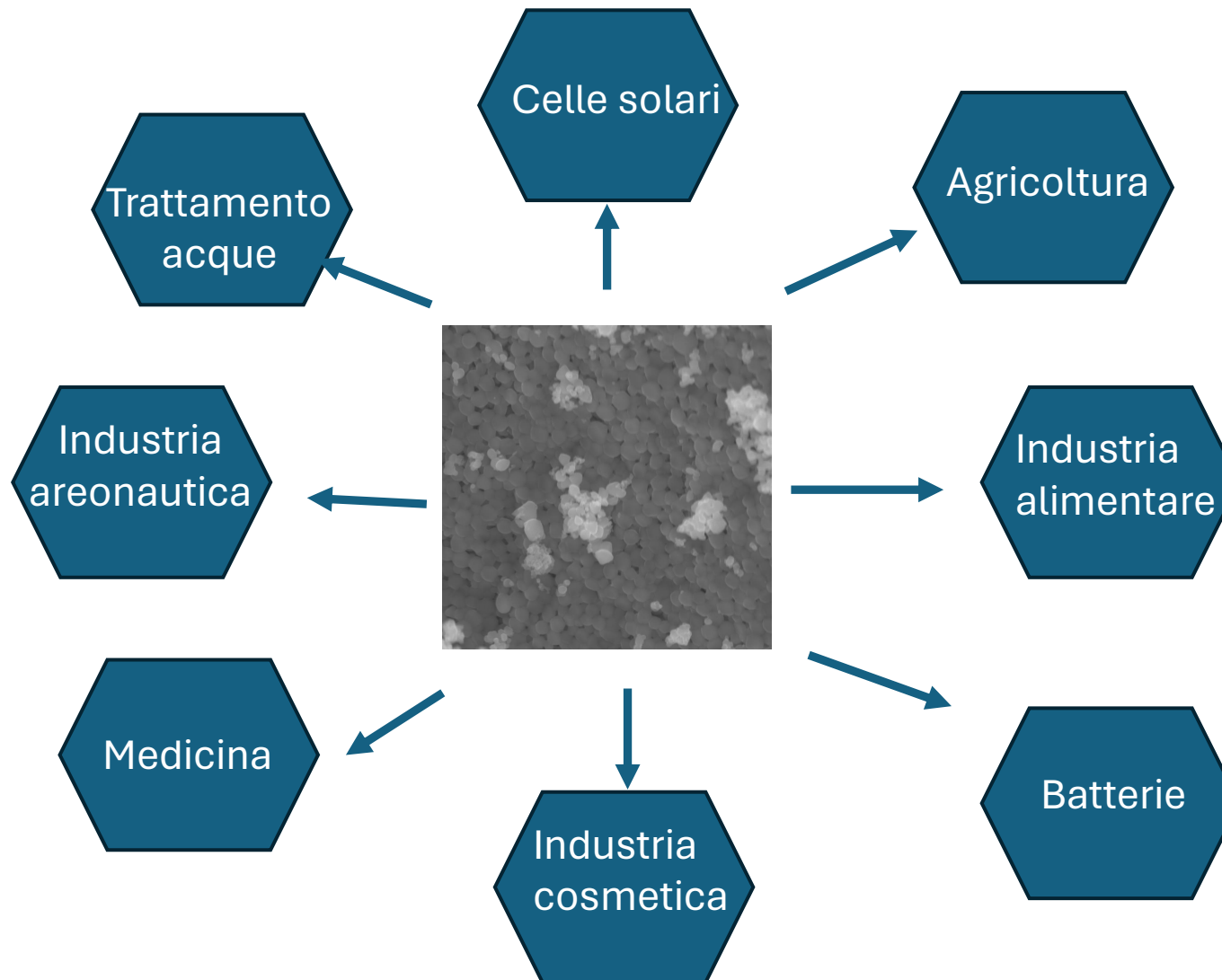


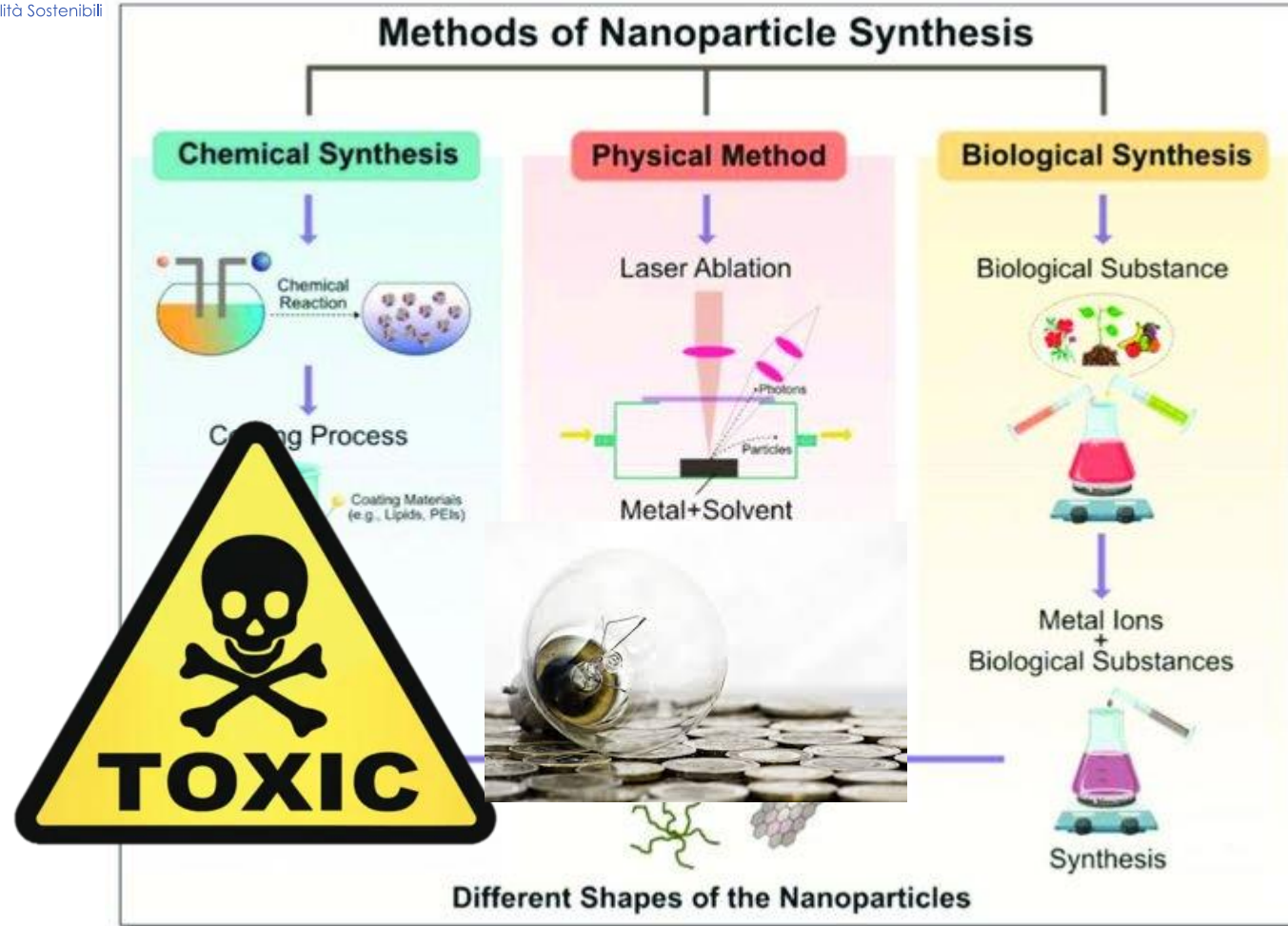


# WP3: POLYPHENOLS AND ENVIRONMENT



## APPLICAZIONI NANOPARTICELLE

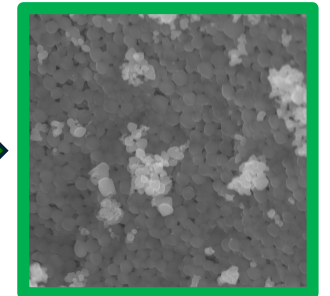








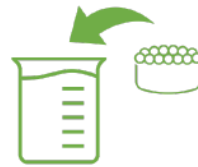
## Green synthesis



## Matrici naturali di scarto per la sintesi di ossido di zinco a morfologia controllata



EtOH/H<sub>2</sub>O  
Solo H<sub>2</sub>O



Nitrato di zinco  
Acetato di zinco



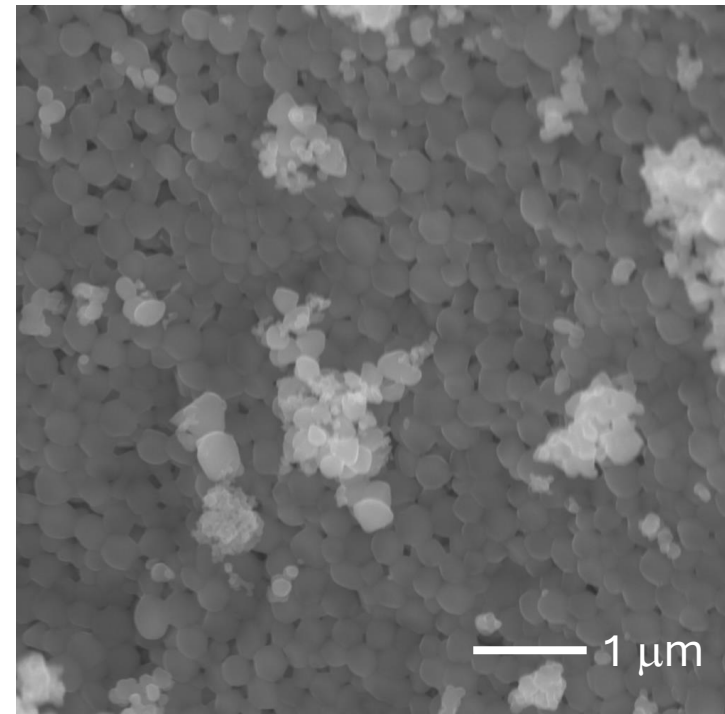
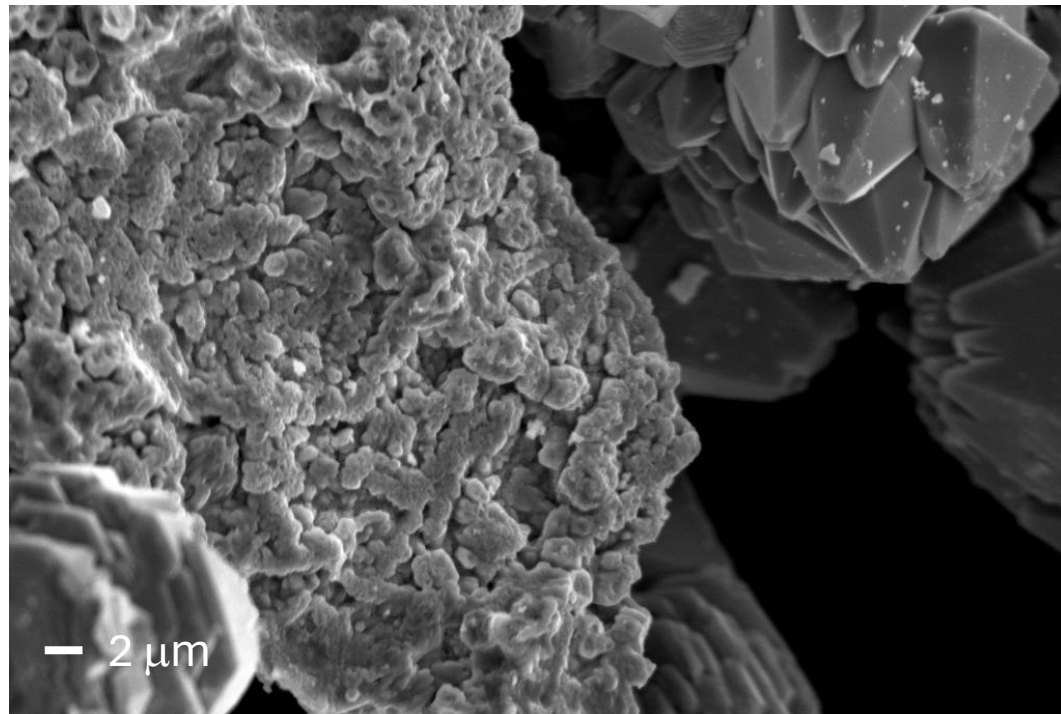
60 °C, 90 °C, 150 °C  
Senza essiccamento (ND)



T = 500 °C  
Tempo = 2 ore



# Diverse morfologie







# Grazie per l'attenzione

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