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Confined **Nanoreactors** for Environmental, Medical & Catalytic Applications



NANOEMCA Project
Call: HORIZON-MSCA-SE-2024
GA No. 101235833

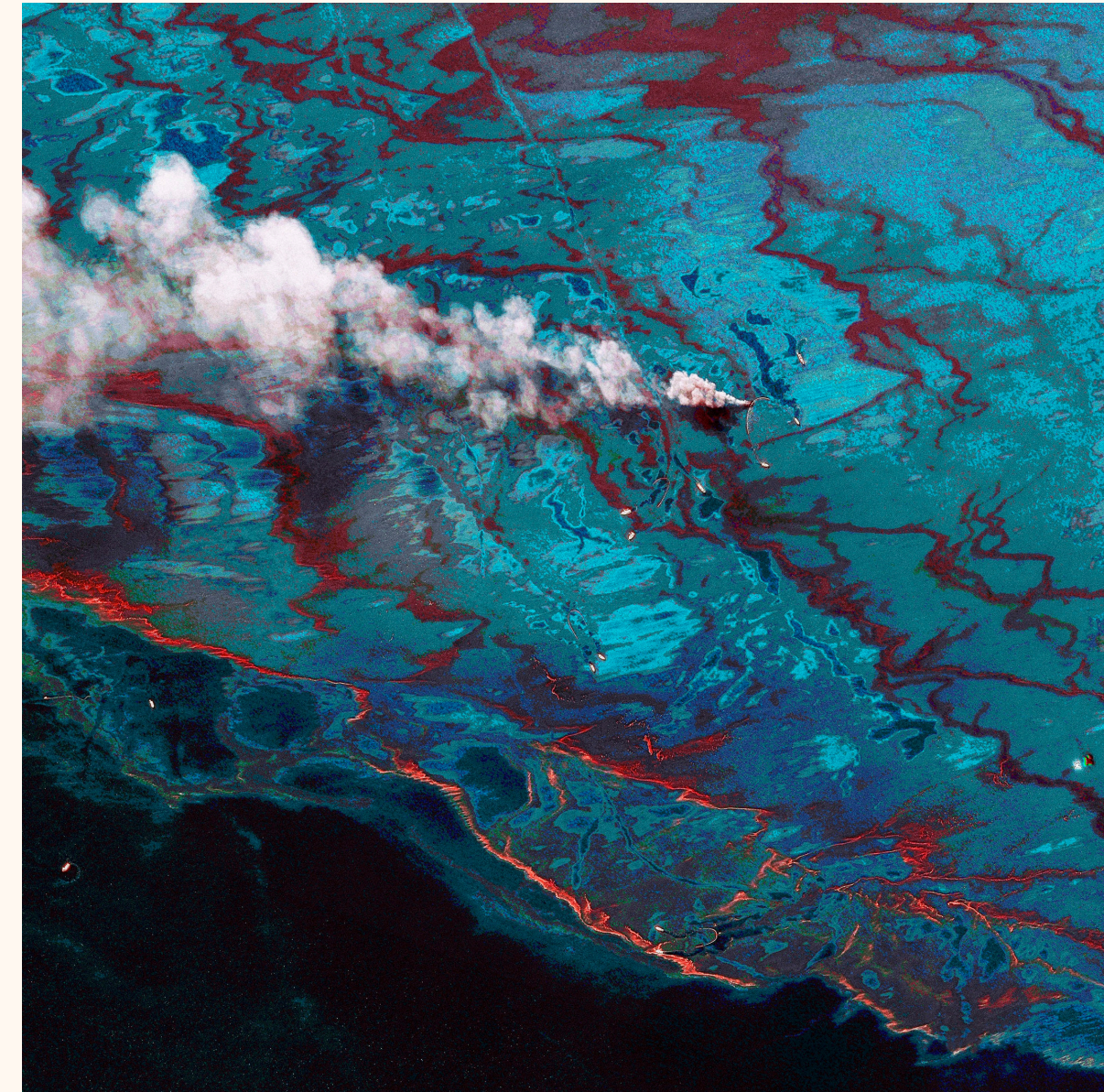


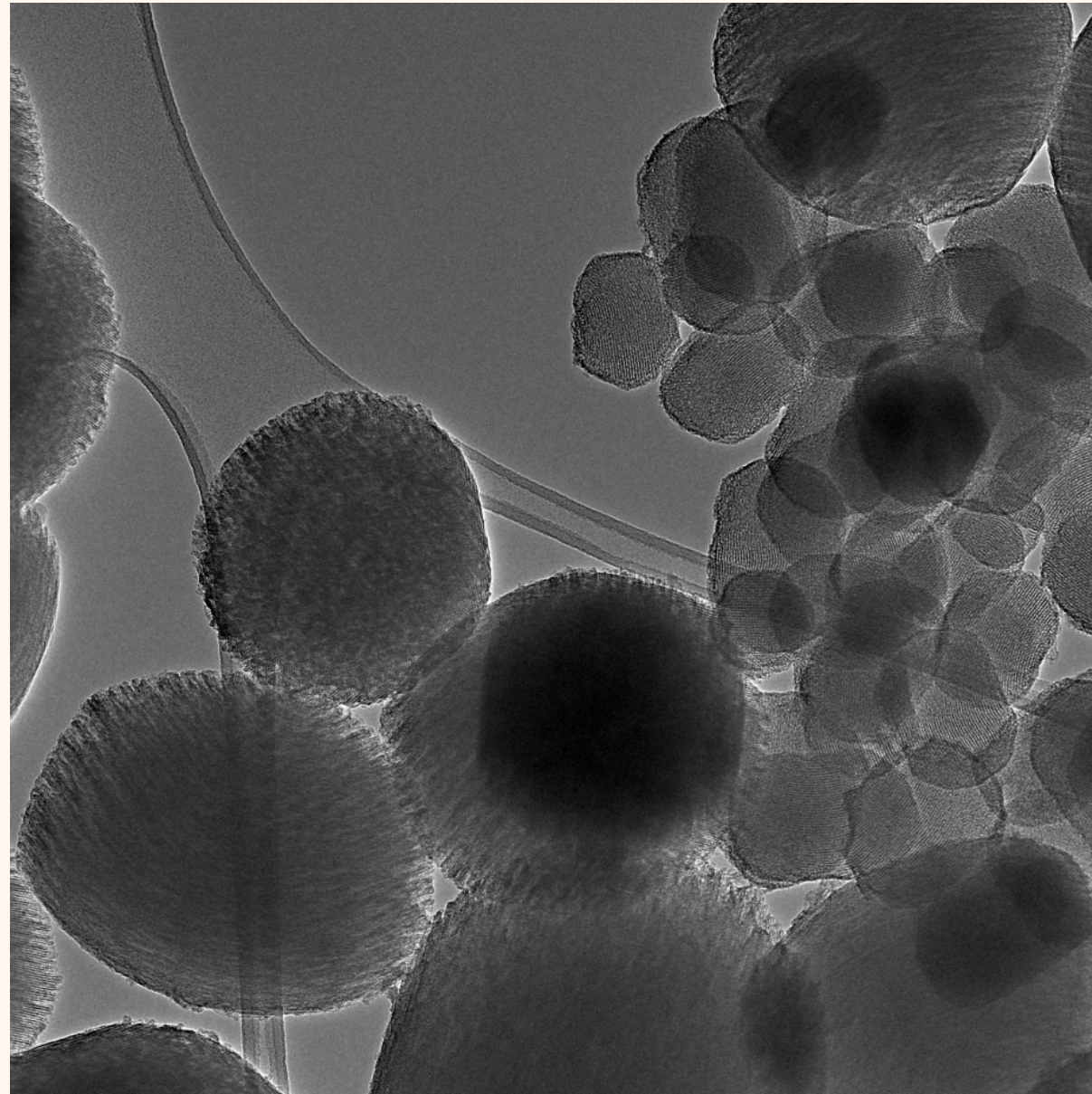
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The problem

Identification

- Water and air contamination from metals, dyes and pharmaceuticals
- Food spoilage and limited shelf life for fresh products
- Need for faster, cheaper, more sensitive medical and environmental sensors





Our solution

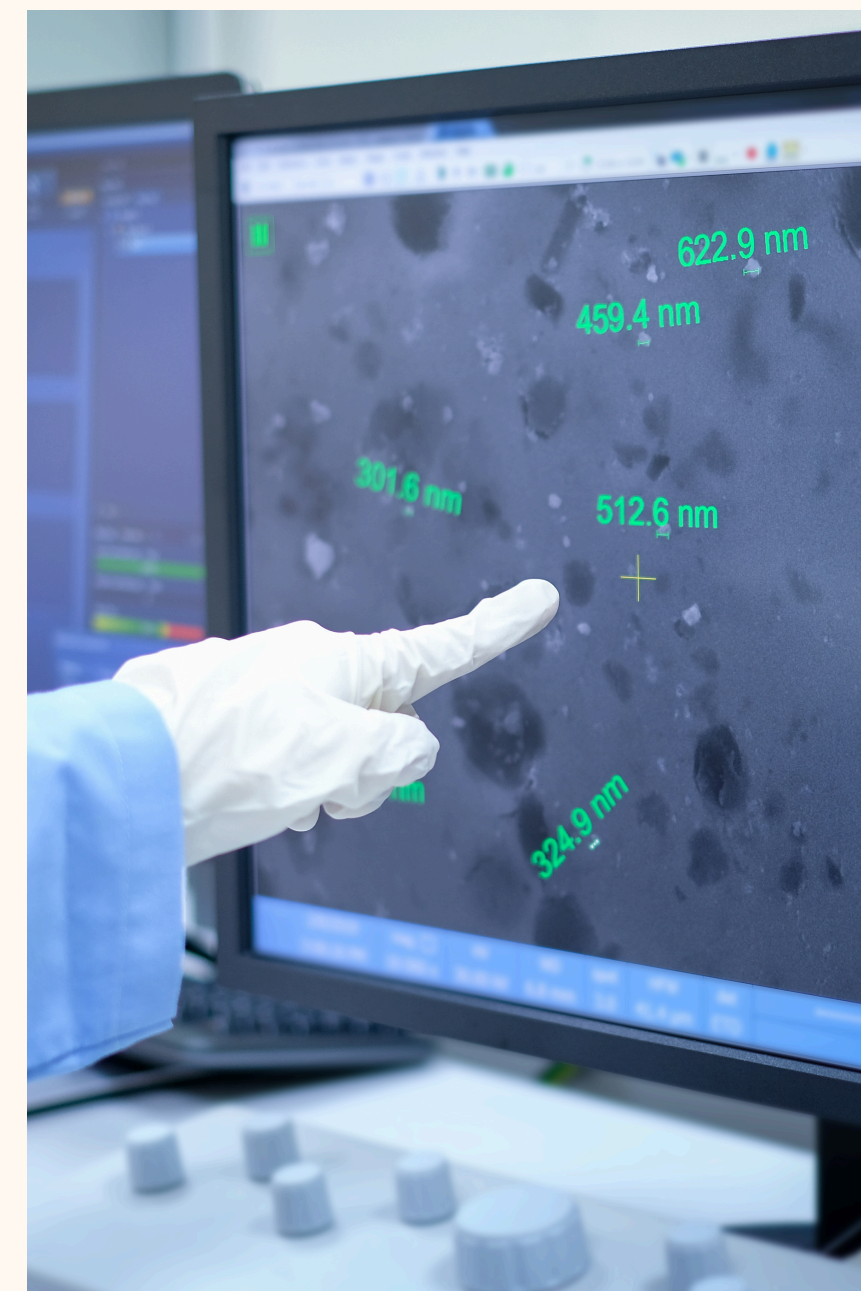
The NANOEMCA approach

- Develop a family of engineered, porous silica materials known as periodic mesoporous organosilicas (PMOs).
- Highly regular, sponge-like framework whose internal walls can be custom-built with organic linkers and loaded with tiny metal species or enzymes.

Our solution

The routes PMOs open

- **Water treatment:** cleaner, more selective adsorbents and photocatalysts that break down persistent pollutants under low-energy light
- **Food sector:** active packaging that slowly releases natural antimicrobials to extend shelf life
- **Sensing and health:** sensitive electrochemical or gas sensors for environmental and clinical monitoring





Our methodology

How do we approach it?

- First, we design the building blocks that become the backbone of the porous material, which are highly controllable.
- We use four complementary ways to make the materials. Every material is checked with standard tools so we know exactly what it looks like and how it behaves.

Our methodology

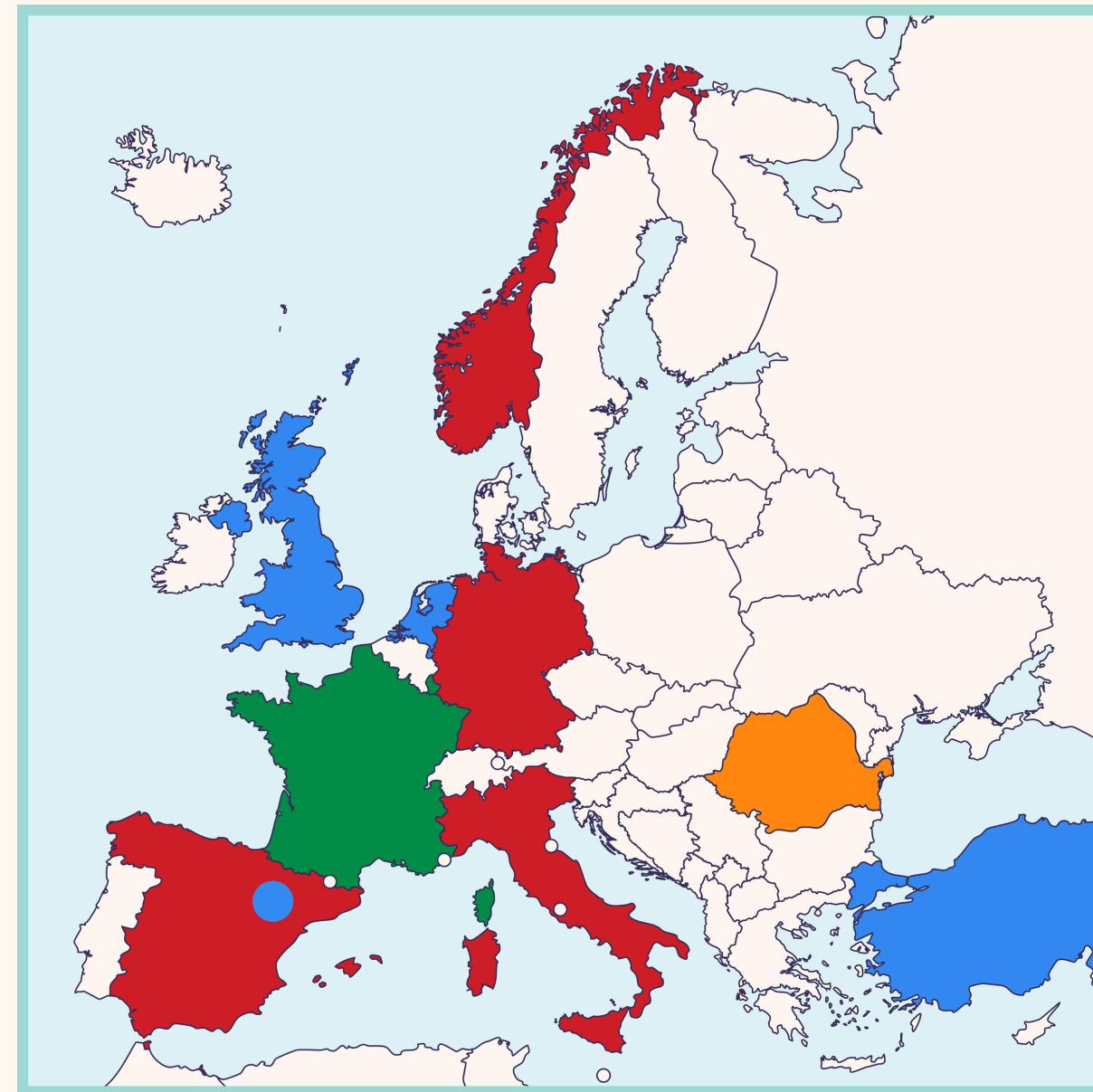
Testing the nanomaterials

- Real wastewater mimic for anti pollutants and water treatment
- Antimicrobial timed testing for food applications
- Sensitivity, response time and stability for biosensors
- Life Cycle Assessment and Life Cycle Costing to compare impacts and costs between methods



Project consortium

NANOEMCA brings together leading academic labs and specialist SMEs to cover materials design, advanced characterisation, application testing and commercialization.



- ◆ SMEs & Industry Partners
- ◆ Research & Tech Institutes
- ◆ Coordinator Country
- ◆ Universities & HEIs

- National University of Science & Technology POLITEHNICA Bucharest (**Coordinator**)
- University of Berlin
- Norwegian University of Science & Technology
- University of Udine
- University of Zaragoza
- University of Pamplona
- Centre National de la Recherche Scientifique
- Luxembourg Institute of Science & Technology
- Aitiip Technology Center
- MEDISEN R&D
- Europe For Business Ltd
- MGM Star Construct SRL
- Kemcristal SRL
- BEIA Cercetare SRL
- ChiralVision B.V.

Universities & HEIs

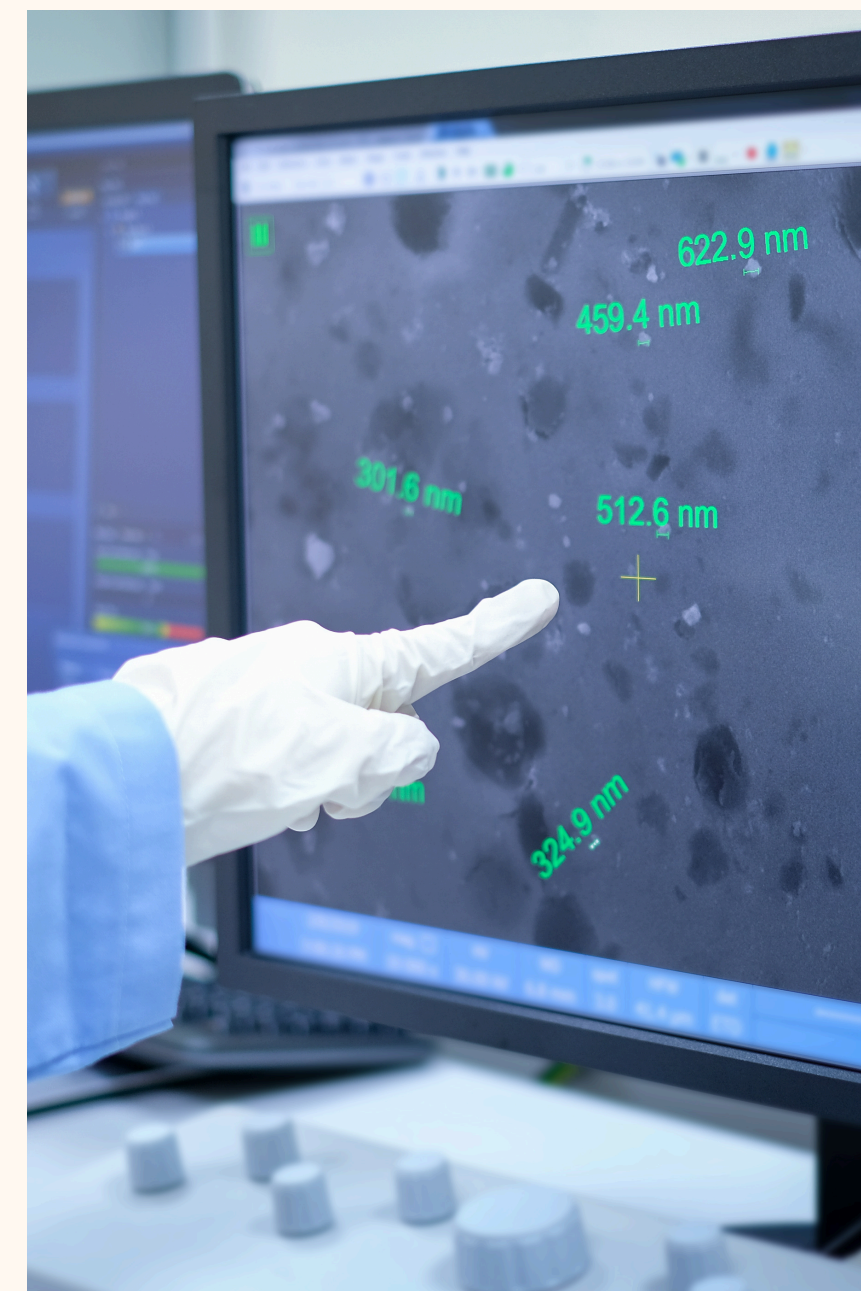
Research & Technology Institutes

SMEs & Industry Partners

Expected outcomes

Concrete deliverables

- **PMO set:** well-characterised nanoreactors with known properties, so others can reproduce and compare them.
- **Ready demonstrators:** adsorbents for water cleaning, photocatalysts for pollutant breakdown, active packaging samples and gas/electrochemical biosensor prototypes for clinical or environmental use.
- **Open data and training materials:** shared on trusted repositories so other researchers and companies can build on them.



Expected outcomes

Concrete deliverables



- **Sustainability and cost reports:** LCA and LCC analyses will show which synthesis and application routes have the lowest environmental footprint and the best economic prospects.
- **Trained people and new partnerships:** Early-career researchers will gain hands-on experience through secondments, setting up new links between universities and SMEs ready for pilot projects.

Capacity building

And mobility programs

- 31 early career researchers plus experienced researchers and technical staff involved in secondments
- Five training modules, workshops, open days and joint supervision for PhD/postdoc students
- Long-term knowledge transfer via secondments and joint IP/data frameworks





Communication

Dissemination and engagement

- **Open science:** data, training materials and publications on trusted repositories
- **Outreach:** workshops, stakeholder meetings, press releases, social media and open days
- **Measurables:** website traffic, publications, conference presentations, workshops and pilot engagements



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