Introduction of the Workshop Women in STEM: "Nanotech and Green Energy"

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Nanotechnology is a vast field and is part of the Megatrends such as Sustainability, AI and Digital Transformation [1]. These topics have a direct impact on our environment, globalization, climate change cost and mobility. When doing research and developing advanced technology, we should consider ethics, norms and awareness as part of the whole ecosystem. In this workshop, organized by AWIN, NanoAlb and collaborators [2], our main focus is **Green Technology** and it covers many topics such as Clean Tech, Decarbonization, Renewable, Energy Storage, Smart Environment, Recycling, Sustainability, etc. **Nanotechnology is involved directly in developing research to make better products and services for a Smart environment** by making better batteries for EV, sustainable fuel for planes, carbon capture factories, roads made by solar panels, Green hydrogen and Reforestation using drones. In particular these sectors benefit from Nanotechnology [3-4]:

- **Offshore Wind Energy**: research on enhanced turbine materials, electrical systems, and corrosion-resistant coatings, improving durability and reducing operational costs.
- **Nuclear power Energy** by advanced Reactor coatings and fuel enhancements, increasing efficiency while reducing nuclear waste and improving overall sustainability.
- **Efficient Energy Storage** by high-capacity, long-life batteries using nano-silicon and solid-state electrolytes, advancing fast-charging and grid storage technologies.
- Innovations in **Biofuels, Renewable fuels and Recycled carbon fuels** are driven by nano-catalysts, which accelerate chemical reactions for cleaner, more sustainable fuel production.
- **Hydrogen** generated via electrolysis for high-performance electrodes and storage materials. Nano-engineered solutions improve storage efficiency, reducing costs and optimizing long-term containment.
- **Carbon Capture** requires nanoporous materials and smart filtration systems, enhancing carbon sequestration efficiency for power plants, industrial waste management, and greenhouse gas reduction.
- **Smart Buildings** as Sustainable architecture integrates self-cleaning surfaces, heat-reflective coatings, and ultra-efficient insulation, reducing energy consumption and improving indoor environmental quality.
- **Circular Economy** by Recycling innovations to optimize battery recovery, wind turbine blade recycling, and material repurposing, minimizing environmental impact while maximizing resource efficiency.
- **AI** drive **Sustainability** breakthroughs by accelerating material discovery, optimizing energy solutions, and enhancing efficiency across renewable sectors. AI-powered analytics refine bioenergy, nuclear power, hydrogen storage, and industrial energy processes, making green technology more adaptive and effective.

The **Green Energy sector**, supported by Nanotechnology and AI, promotes **new research opportunities, workforce expansion, and evolving business models** [5-6]. These advancements also foster inclusivity, creating pathways for **Women and Younger generations** in STEM to consider being part of these emerging and increasing sector [7-8].

References

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