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Self-Healing Nanomaterials and Smart Polymers: Innovations for Sustainable Nanotechnology

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The development of self-healing materials has created new opportunities for extending the lifespan and performance of advanced engineering systems. This presentation reviews recent advances in dynamic polymers, nanocomposites, supramolecular chemistry, and self-assembling nanostructures capable of autonomous repair after mechanical damage. These innovations significantly improve material durability while reducing maintenance costs and environmental impact.

The session highlights applications in biomedical devices, flexible electronics, aerospace engineering, and sustainable manufacturing. Emerging research on recyclable polymers, responsive nanomaterials, and environmentally friendly fabrication processes supports the transition toward a circular economy. Future perspectives include intelligent nanomaterials capable of sensing, adapting, and repairing themselves in real-time.

Biography

Ludwik Leibler is Professor of Soft Matter Physics at ESPCI Paris, France. His research focuses on polymer nanotechnology, self-healing materials, soft matter physics, and sustainable materials science. He is internationally recognized for pioneering self-repairing polymer technologies.