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Reconfigurable Integrated Photonics for Next-Generation Optical Computing and Quantum Technologies

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Abstract:

The rapid advancement of nanophotonics and integrated optics is driving the transition toward reconfigurable and adaptive photonic systems capable of operating at the speed of light [1]. My talk will overview recent breakthroughs in reconfigurable integrated photonics, focusing on the development of dynamically tunable optical components that enable ultra-fast signal processing, optical memory storage, and quantum photonic applications[2-5]. I will introduce novel material platforms with high optical nonlinearity and phase-change properties, facilitating real-time reconfigurability in compact photonic circuits. Special emphasis will be placed on the integration of photochromic materials, metasurfaces, and Fabry-Pérot resonators to achieve adaptive optical functionality. Additionally, the role of AI-driven optimization for self-learning photonic systems will be discussed, paving the way for autonomous, high-performance optical computing and secure quantum communications. These advancements hold significant promise for applications in next-generation telecommunication networks, quantum information processing, and energy-efficient data centers.

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