Photonic In-Memory Computing

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Thanks to the great success of optical fiber communication in the field of ultra-high-speed data transmission, as well as the rapid development of silicon-based photonics and optoelectronics integration, photonic computing has been widely and deeply studied, which is one of the important directions for the development of integrated circuits in the Post-Moore era. At the same time, the rise of artificial intelligence is rapidly driving the development of new computing architectures, such as neuromorphic computing inspired by the human brain. To mimic the function of the brain from a hardware perspective, neuromorphic computing needs to focus on two levels: collocation of storage and computing and artificial neural networks. Here, we combine non-volatile phase-change materials (PCMs) and optical waveguides to implement photonic in-memory computing and associative learning networks to construct the above two neuromorphic paradigms. Moreover, in recent years, we have focused on the development of new phase-change materials in photonics applications.