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Novel microresonator with broken angular momentum symmetry ALEXANDER A. GOVYADINOV, Oregon State University, Dept. of Physics, EVGENII E. NARIMANOV, Princeton University, EE Dept., VIKTOR A. PODOLSKIY, Oregon Sate University, Dept. of Physics — Dielectric microcavity resonators are the essential components of modern high-performance microsensors and microlasers. We present a novel, "ratchet"-shaped, class of microresonators with broken angular momentum symmetry. We develop the description of scattering in such resonators and demonstrate their fundamental difference from circular systems. The ratchet structures do not support any stable ray trajectories, and therefore no "conventional" whispering-gallery mode can exist in these systems. However, the long-lived (high-Q) modes do exist in the ratchet resonator and are exponentially localized in the angular momentum space, explicating Anderson dynamical localization. We demonstrate that in contrast to conventional microdisks, the proposed system has a low leakage loss accompanied with strong coupling to the incident radiation. This, in turn, leads to orders-of-magnitude performance advantage of the devices based on ratchet resonators over the conventional systems.

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