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**Vertical cavity surface emitting lasers from all-inorganic perovskite quantum dots** HANDONG SUN, YUE WANG, Nanyang Technological University, XIAOMING LI, HAIBO ZENG, Nanjing University of Science and Technology — We report the breakthrough in realizing the challenging while practically desirable vertical cavity surface emitting lasers (VCSELs) based on the CsPbX<sub>3</sub> inorganic perovskite nanocrystals (IPNCs). These laser devices feature record low threshold (9 J/cm<sup>2</sup>), unidirectional output (beam divergence of  $\sim 3.6^\circ$ ) and superb stability. We show that both single-mode and multimode lasing operation are achievable in the device. In contrast to traditional metal chalcogenide colloidal quantum dots based lasers where the pump thresholds for the green and blue wavelengths are typically much higher than that of the red, these CsPbX<sub>3</sub> IPNC-VCSEL devices are able to lase with comparable thresholds across the whole visible spectral range, which is appealing for achieving single source-pumped full-color lasers. We further reveal that these lasers can operate in quasi-steady state regime, which is very practical and cost-effective. Given the facile solution processibility, our CsPbX<sub>3</sub> IPNC-VCSEL devices may hold great potential in developing low-cost yet high-performance lasers, promising in revolutionizing the vacuum-based epitaxial semiconductor lasers.

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