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### **Hyperhoneycomb iridate beta-Li<sub>2</sub>IrO<sub>3</sub> as a platform for Kitaev spin liquid**

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Realization of quantum spin liquid has been a long-sought dream in condensed matter physics, where exotic excitations and unconventional superconductivity upon doping are expected. Honeycomb iridates recently emerged as a possible materialization of Kitaev spin liquid with frustrated “*bond – dependent ferromagnetic interaction*”. However, the real materials,  $\alpha$ -Na<sub>2</sub>IrO<sub>3</sub> and  $\alpha$ -Li<sub>2</sub>IrO<sub>3</sub>, undergo antiferromagnetic ordering likely due to the presence of other dominant magnetic interactions and lattice distortion. We discovered a new form of Li<sub>2</sub>IrO<sub>3</sub>,  $\beta$ -Li<sub>2</sub>IrO<sub>3</sub>, which comprises a three-dimensional analogue of honeycomb lattice dubbed as “hyperhoneycomb”. Each Ir<sup>4+</sup> ion of the hyperhoneycomb lattice has three neighboring like ions rotated by 120° and thus the local structure is identical with 2D honeycomb, indicating that the hyperhoneycomb lattice is a new platform for Kitaev physics.  $\beta$ -Li<sub>2</sub>IrO<sub>3</sub> displays a spiral magnetic order below 38 K, which likely originates from dominance of ferromagnetic Kitaev interaction. We argue that  $\beta$ -Li<sub>2</sub>IrO<sub>3</sub> locates in a close proximity to Kitaev spin liquid. We also discuss the spin liquid behavior observed in a new honeycomb iridate obtained by chemical modulation.