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Currentless reversal of Néel vector in antiferromagnets YURIY SEMENOV, XILAI LI, KI WOOK KIM, North Carolina State University — The bias driven perpendicular magnetic anisotropy is a magneto-electric effect that can realize 90° magnetization rotation and even 180° flip along the easy axis in the ferromagnets with a minimal energy consumption. This study theoretically demonstrates a similar phenomenon of the Néel vector reversal via a short electrical pulse that can mediate perpendicular magnetic anisotropy in the antiferromagnets. The analysis based on the dynamical equations as well as the micromagnetic simulations reveals the important role of the inertial behavior in the antiferromagnets that facilitates the Néel vector to overcome the barrier between two free-energy minima of the bistable states along the easy axis. In contrast to the ferromagnets, this Néel vector reversal does not accompany angular momentum transfer to the environment, leading to acceleration in the dynamical response by a few orders of magnitude. Further, a small switching energy requirement of a few attojoules illustrates an added advantage of the phenomenon in low-power spintronic applications.

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