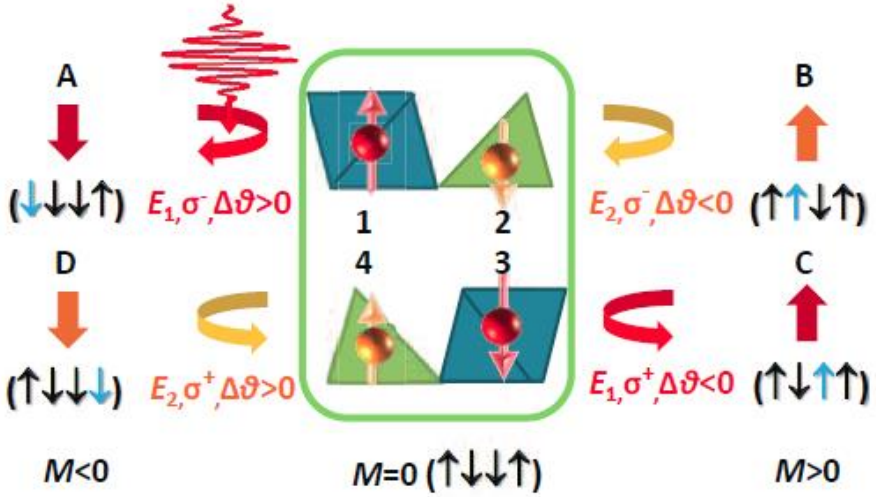
Picosecond creation of switchable optomagnets from a polar antiferromagnet with giant photoinduced Kerr rotations



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Spin orientation with long polarized lifetime and easily detectable signal is a major goal for spintronics. Here, we demonstrate switchable optomagnet effects in $(Fe_{1-x}Zn_x)_2Mo_3O_8$, from which we can obtain tunable magnetization that is created from zero magnetization in the antiferromagnetic state without magnetic fields. It is accomplishable via utilizing circularly-polarized laser pulses to excite spin-flip transitions in polar antiferromagnets that have no spin canting, traditionally hard to control without very strong magnetic fields. The spin controllability in $(Fe_{1-x}Zn_x)_2Mo_3O_8$ originates from its polar structure that breaks the crystal inversion symmetry, allowing distinct on-site *d*-*d* transitions for selective spin flip. The present study, creating switchable giant optomagnet effects in polar antiferromagnets, sketches a new blueprint for the function of antiferromagnetic spintronics.

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