



Seminar@ISM



CNR
Istituto di Struttura
della Materia

03

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When?

April 03, 2025
14:30 (CEST)

Where?

@ Seminar Room T1 -
Elettra Trieste

or



Info at

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Pump-driven optical Kerr rotation and hidden quantum entanglement in centrosymmetric bulk WSe₂

Single-layer semiconducting transition-metal dichalcogenides (TMDs), lacking point inversion symmetry, provide an efficient platform for valleytronics, where the electronic, magnetic, valley and lattice degrees of freedom can be selectively manipulated by using polarized light. This task is however thought to be limited in parent bulk compounds where the point inversion symmetry is restored. Exploiting the underlying quantum physics in bulk materials is thus one of the biggest paradigmatic challenges. Here we show that a sizable optical Kerr rotation can be efficiently generated in a wide energy range on ultrafast timescales in bulk WSe₂, by means of circularly-polarized light. We rationalize these findings as a result of the hidden spin/layer/valley quantum entanglement. The spectral analysis reveals clear features at the three characteristic frequencies corresponding to the A-, B- and C-exciton edges. The origin and the relative sign of all these features is shown to stem from the selective Pauli blocking of intralayer and interlayer optical transitions. The long lifetime of the broadband Kerr response (~500 fs) provides a strong indication that coupled photo-induced electron and hole densities survive in bulk compounds longer than previously expected. The present report demonstrates that a hidden quantum entanglement is operative also in bulk centrosymmetric layered materials, opening the way for an effective exploitation of bulk WSe₂ in optoelectronic applications.