UNL Department of Physics and Astronomy presents:

Exploring quantum phenomena and photonic interfaces of transition metal dichalcogenides system

PRESENTED BY

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ABSTRACT

2D materials offer a unique platform for the exploration of quantum effects in the 2D limit. Among these materials, transition metal dichalcogenides (TMDCs), which are 2D semiconductors, stand out due to their exceptional optical quality. The strong interaction between the light field and 2D TMDCs not only allows us to probe exotic quantum phenomena but also provides us with a powerful tool to tune the material properties. In this presentation, I will discuss our optical investigations of excitonic states and correlated free carriers within monolayer TMDCs. Specifically, by employing microwatt-level optical pumping, we have generated the long-range spin polarization of itinerant electrons—a fascinating outcome resulting from interaction-induced magnetic ordering. Furthermore, we have developed a nanophotonics-TMDCs interface. The interface exploits circularly polarized evanescent fields generated by tightly confined guided modes in nanophotonics, coupling them with the valley/spin index in 2D TMDCs. This opens exciting possibilities for novel optoelectronic, valleytronic, and spintronic technologies, paving the way for future advancements in quantum technology.