Light-induced phenomena in condensed matter system from ab initio approach

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Recent studies on light-matter interaction have attracted attention by showing unprecedented physical phenomena and the possibility of application devices. For example, light-induced topological phase transitions in WTe2 and ZrTe5 are experimentally demonstrated [1-2]. A follow-up theoretical study explained that this topological phase transition originates from the lattice distortion induced by exciting electronic structure [3]. Also, light-induced ferroelectric transitions in quantum paraelectric SrTiO3 are experimentally demonstrated by applying mid-infrared and terahertz lights [4-5]. It is theoretically proved that the unique property of the quantum paraelectric phase could lead to terahertz field-induced ferroelectricity [6]. These results indicate that light can control the phase of the material with various microscopic mechanisms and suggest the possibility of brand-new optical control devices. This seminar will introduce recent studies on light-induced phase transition in condensed matter systems and related microscopic mechanisms from *ab inito* approach.

Diagram

Description automatically generated

Figure . Light-induced phenomena and their possible microscopic mechanism.

References

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