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# High harmonic generation in condensed and engineered materials: introduction

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**The emerging field of high harmonic generation in condensed matter systems lies at the confluence of strong-field physics, ultrafast optics, and nanotechnology and offers numerous avenues for fundamental research and applications. The goals of this JOSA B feature issue on high harmonic generation in condensed and engineered materials are to facilitate interaction between the different communities and to provide an up-to-date snapshot of the current status of this rapidly developing interdisciplinary field at the frontier of condensed materials and ultrafast physics.** 

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High harmonic generation (HHG) in condensed material is a powerful tool that can provide a new route to probing attosecond electron dynamics in complex systems and pave the way toward a new generation of optoelectronic functional elements and devices. In fundamental research, this includes but is certainly not limited to the realization of optical imaging approaches of band structures and the elucidation of new topology of matter. Similarly, industrial applications push toward new imaging techniques such as the inspection of sample delivery. Conversely, in order to nurture new momenta in strong laser–matter interaction from both academic and private sector perspectives, it is fundamental to elucidate the nature of decoherence in condensed materials. HHG in condensed and engineered materials makes it possible to reveal crucial signatures of the decoherence processes and provides unique insights into the underlying mechanisms. For instance, many-body response characteristics can be revealed by HHG in highly correlated material with potential phase changes, or in metamaterials where localized plasmon resonance is taking place.

Full exploitation of the above-described array of efforts requires corresponding developments in instrumentation and material science as well as in theory and computations. The articles collected in the present feature issue offer a wide panoply, representing the multidisciplinary nature of research in condensed and engineered materials. They also demonstrate how the investigation of all aspects of this vibrant field is critical for the development of future technologies as well as for the progress of fundamental science.