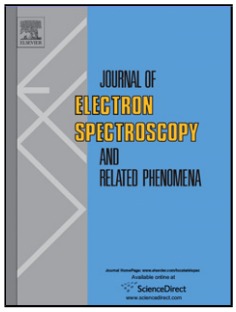


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# Efficient and tunable high-order harmonic light sources for photoelectron spectroscopy at surfaces

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**Abstract**

With the recent progress in high-order harmonic generation (HHG) using femtosecond lasers, laboratory photoelectron spectroscopy with an ultrafast, widely tunable vacuum-ultraviolet light source has become available. Despite the well-established technique of HHG-based photoemission experiments at kilohertz repetition rates, the efficiency of these setups can be intrinsically limited by the space-charge effects. Here we present recent developments of compact HHG light sources for photoelectron spectroscopy at high repetition rates up to megahertz, and examples for angle-resolved photoemission experiments are demonstrated.

*Keywords:* High-order harmonic generation; Photoelectron spectroscopy; Ag(001)

## 1. Introduction

Photoelectron spectroscopy (PES) has evolved into a powerful method to explore the electronic structure of materials. With the rapidly growing interest in material science with emphasis on the novel electronic properties, further development of modern PES and its light sources is strongly motivated [1, 2]. To map the electronic structure in general, photoemission experiments can be performed using polarized light with a widely tunable

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