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2007 J. Phys.: Condens. Matter 19 350301

(http://iopscience.iop.org/0953-8984/19/35/350301)

J. Phys.: Condens. Matter **19** (2007) 350301 (1p) doi:10.1088/0953-8984/19/35/350301

PREFACE

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The Fermi surface of a crystalline solid represents a paradigm of quantum solid state physics: its shape is dictated by quantum mechanics, by the Fermi–Dirac statistics for electrons and by the character of Bloch states in solids. Most physical observables depend in one or other way on the shape of the Fermi surface. Due these reasons, the Fermi surface of solids has been investigated since more than 50 years using different techniques, the most important ones being the de Haas-van Alphen effect and Compton scattering. These techniques probe very precisely the Fermi surface of crystalline solids, but surface sensitive techniques are advantageous whenever no large single-crystalline samples are available, if the Brillouin zone is small or if the surface is significantly modified. In the case of low-dimensional materials, only surface sensitive techniques can be used to analyze the Fermi surface. Angle-resolved photoemission is the most powerful surface technique able to probe the Fermi surface of a solid or a surface. Also scanning tunnelling microscopy provides information on the Fermi surface, under favourable conditions.

This special section presents a collection of nine invited review articles on the application of these two techniques to the study of the Fermi surface. The first paper by Kurtz reviews some general aspects on the measurement of a Fermi surface using photoemission. The next three articles deal with the Fermi surface of bulk materials. The case of a charge density wave material, where the Fermi surface is expected to play a crucial role in the stability of a particular phase, is considered in the paper by Aebi. Takahashi analyzes the electronic structure and Fermi surface of boride superconductors. Finally, Ding presents a study on how doping affects the Fermi surface of cobaltates and its relationship with other properties of these materials. The next four articles consider different examples of the application of angle-resolved photoemission to low-dimensional systems, which is one of the most attractive features of this technique. The Fermi surface of metallic quantum well states is studied in the paper of Kevan. Bertel analyzes the possibilities and effects of Fermi surface tuning in a two-dimensional system. The next two papers investigate the Fermi surface of metal/semiconductor interfaces. Hasegawa studies the Fermi surface of different reconstructions of Ag on Si(111), and its relationship with transport properties. Mascaraque analyzes the Fermi surface of the debated Sn/Ge(111) and Pb/Ge(111) interfaces. The last paper by Simon uses scanning tunnelling microscopy to extract the band structure and Fermi surface of a semimetallic epitaxial layer.

The editor is grateful to all the invited authors for their contributions to this special section of *Journal of Physics: Condensed Matter*.

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