

Preface

Clusters that exclusively consist of metal atoms often are rather elusive and thus have mostly been detected and investigated in the gas phase or are the playground for theoreticians. However, well-defined bare metal clusters of p block elements can be obtained in macroscopic scale from *Zintl phases*, which have been discovered, studied and named after the German chemist *Eduard Zintl*. Such phases can be described as intermetallic compounds in which the valence electrons of the more electropositive component are transferred to the more electronegative partner under formation of salt-like compounds which in many cases contain anionic cluster units of p block metals and semi-metals as building blocks. This subject is treated in a preceding book of this series in Volume 139 (*Zintl Phases*). In some cases, *Zintl phases* are soluble in polar aprotic solvents, and the solutions contain intact moderately charged, discrete so-called *Zintl anions*, which then can be used in situ as starting materials for the synthesis of a plethora of main group element clusters. Prominent examples for such ‘extractable’ polyanions are E_7^{V3-} and E_9^{IV4-} , which some of them have been observed in solution already at the end of the nineteenth century. However, the exploration of their fascinating chemistry dates back only a few decades.

This book documents the metamorphosis of *Zintl ions* from objects of virtue to valuable precursors for the synthesis of larger main group element cluster units of well-defined composition and size. Historical milestones of *Zintl ion* chemistry have been reviewed (Eduard Zintl: His life and scholar work. Kniep R in [1]; [2, 3]), but are also mentioned in the introductory remarks of some of the contributions to this book. The chemical bonding in homo- and heteroatomic *Zintl ions* and their structures are summarized and compared to those of related main group element clusters, with main focus on deltahedral polyanions of Group 14 elements in the chapter by *RB King*. *N Korber* and *S Gärtner* describe polyanions of Group 14 and 15 elements in alkali and alkaline earth metal solid state compounds and solvates in a subsequent chapter. The Chapter by *B Eichhorn* and *S Kocak* is dedicated to the dynamic behavior of Group 14 element *Zintl ions* and their derivatives in solution which has extensively been studied by NMR experiments. The rich chemistry of Group 14 and Group 15 element polyanions with special emphasis on the formation

of intermetalloid clusters ('molecular alloys') and their relationship to ligand-stabilized cage molecules is outlined by *TF Fässler*, and the last chapter by *M Kanatzidis* and *GS Armatas* focuses on the use of Zintl ions for the synthesis of Ge-based materials for possible photovoltaic applications.



Bust of Eduard Zintl at the Technical University of Darmstadt

- [1] Kauzlarich SM (ed) (1996) Chemistry, structure, and bonding of zintl phases and ions. VCH, Weinheim
- [2] Corbett JD (1985) Polyatomic Zintl anions of the post-transition elements. *Chem Rev* 85: 383–397
- [3] Fässler TF (2001) The renaissance of homoatomic nine-atom polyhedra of the heavier carbon-group elements Si to Pb. *Coord Chem Rev* 215:347–377

Technical University Munich
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T.F. Fässler



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