Preface

The broad field of materials chemistry or materials science is a constantly evolving and growing one, and thus one that defies having what might be called fixed, predetermined, or defined edges. In the past it has been considered an area of applied solid state chemistry; but today there are some liquids and even gases that can be considered part of materials chemistry. This book contains sections and chapters on materials that are considered old, established and defined – subjects that will be found in virtually all materials chemistry books – but also on subjects that are new and rapidly expanding.

No book on materials chemistry would be complete without some discussion of metals, plastics, ceramics, glasses and cement. These, plus a few other traditional materials, are still widely used today. For example, numerous species of wood are widely used in the modern world, even as wood composites, wood laminates, and artificial wood or plastic wood find increasing applications and uses in our economy. Yet some materials that have been known for decades have found increasing uses and new applications over time. The perfect example might be neodymium, first discovered and reported by Carl Auer von Weisbach in 1885, first isolated and purified in 1925, considered a curiosity for decades, but now used as a component of supermagnets. Thus, the element is a component in the billions of cellular phones in service throughout the world.

Of course, there are some thoroughly modern materials that should be discussed in any materials chemistry book. Subjects such as semi-conductors come quickly to mind, even though experts in the field might no longer consider them to be entirely modern – with the earliest patent for one now being more than 100 years old.

More modern materials would certainly include superconductors, a field that is still growing both in terms of materials which exhibit the phenomenon, and in terms of the theoretical background behind superconductivity at various temperatures. The superconducting mag-lev trains that thirty years ago were a promise for the future remain just that, a promise for some undetermined future. But this application as well as others may now be much closer.

While different books on materials science and materials chemistry will routinely cover several topics that are now considered common, and that are considered widespread in terms of established applications, many do not yet mention metal-organic frameworks – aka MOFs – or metal foams, or bio-based materials such as mycelium. I have tried to incorporate information and discussion on these topics, as it is probably fair to say they represent some of the newest classes of materials that are finding a broad possible range of uses.

Thank you.

https://doi.org/10.1515/9783110656770-202

Additionally, when writing a book like this, I need to thank several people, all of whom have helped answer my questions as this work was put together. Klaus Friedrich, Matt Mio, Kate Lanigan, Kendra Evans, Mary Lou Capsrs, Jon Stevens, Sue White, and Heinz Plaumann, thank you all for giving me tips and advice, even when you did not know it was for this book, and thought it was just another one in my never-ending string of random questions. I also have to thank Jane Schley and Meghann Murray for their help at many points along the way. My editors, Ria Sengbusch and Karin Sora, have both been tremendously helpful and patient as this project has come to fruition. Thank you both. Finally, I must thank my wife Marye, and my sons David and Christian for putting up with all the griping and moaning I do when I'm in the midst of a project, a trait I suspect I share with many authors.