Metal clusters and nanoparticles

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For more than five decades the chemistry of metal-rich compounds, exemplified by molecules containing many metal centres, has counted as one of the major research areas of inorganic chemistry. Initially, attention focused on the synthesis of such compounds with metal carbonyl clusters being predominantly investigated.

By the 1980s, this field had matured, but a renaissance occurred with the availability of more advanced and sophisticated physical methods used to characterise such compounds. This renaissance can also be traced back to the rediscovery of colloid chemistry as well as to the realisation that metal-rich cluster complexes can be considered as a bridge between classical small metal complexes of the elements and their bulk phases. In this respect, the study of cluster compounds allows for correlations to be developed between structure and property, for example in terms of size-dependent phenomena. Thus it can be shown that optical and electronic properties depend critically on particle size and it is possible to modulate these simply by varying the size of the compounds. Consequently, the chemical control which can be exerted on such cluster systems offers the possibility to modify and tailor properties of interest. In addition, such compounds are suitable objects for use in future nanotechnology, nanochemistry and nanobiology research and applications.

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