

1. Record Nr.	UNINA9910765775303321
Titolo	Polyoxometalates // edited by Greta Ricarda Patzke and Pierre-Emmanuel Car
Pubbl/distr/stampa	Basel : , : MDPI, , 2016
ISBN	3-03842-162-6
Descrizione fisica	1 online resource (254 pages)
Disciplina	546.3
Soggetti	Electrochemistry Catalysis Polyoxometalates
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
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Polyoxometalates (POMs), known since the mid-18th century, have fascinated generations of researchers and continue to attract promising young scientists to date. Ever since the first pioneering investigations into the manifold structures and properties of POMs, polyoxometalate chemistry emerged as an independent and highly productive area of research, with constant and exciting new developments from an exceptionally wide range of scientific disciplines, such as synthetic/structural chemistry, biology, physics and theoretical chemistry. Indeed, polyoxometalates as highly versatile transition metal oxo-cluster materials offer virtually endless options for future applied devices. They excel through their: wide compositional and structural diversity, giving rise to flexible tuning of electronic properties, versatile redox properties, chemical stability and robustness. Among this growing family of oxo-clusters, two POM classes, namely transition metal substituted polyoxometalates (TMSPs) and lanthanide substituted polyoxometalates (LnSPs), are currently attracting special interest due to their promising role in current competitive research areas, e.g., water splitting, catalysis, magnetism, electronic materials and bio-medical applications. This Special Issue focuses on the most recent advances in polyoxometalate chemistry covering synthetic methods, mechanistic insights and application perspectives in photocatalysis (water splitting), organic catalysis, magnetism, bio-medicine, electrochemistry and other currently relevant areas.

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