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This comprehensive three-volume handbook brings together a review of the current state together with the latest developments in sol-gel technology to put forward new ideas. The first volume, dedicated to synthesis and shaping, gives an in-depth overview of

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The Sol-Gel Handbook - Synthesis, Characterization, and Applications: Synthesis, Characterization and Applications, 3-Volume Set August 2015 DOI: 10.1002/9783527670819.ch46

The Sol-Gel Handbook - Synthesis, Characterization, and ...

The Sol-Gel Handbook Volume 1: Synthesis and Processing Volume 2: Characterization and Properties of Sol-Gel Materials Volume 3: Application of Sol-Gel Materials. The Editors Prof. David Levy Inst. Ciencia de Materiales de Madrid, ICMM - CSIC Sor Juana Ines de la Cruz 3 28049 Madrid Spain

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Description. This comprehensive three-volume handbook brings together a review of the current state together with the latest developments in sol-gel technology to put forward new ideas. The first volume, dedicated to synthesis and shaping, gives an in-depth overview of the wet-chemical processes that constitute the core of the sol-gel method and presents the various pathways for the successful synthesis of inorganic and hybrid organic-inorganic materials, bio- and bio-inspired materials, ...

The Sol-Gel Handbook: Synthesis, Characterization, and ...

A gel consists of a porous, three-dimensionally continuous solid network surrounding and supporting a continuous liquid phase ("wet gel"). In most sol-gel systems for the synthesis of oxide materials, gelation

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(i.e., formation of the gels) is due to the formation of covalent bonds between the sol parti-cles. Gel formation can be reversible when other bonds are involved, such as van der Waals forces or hydrogen bonds.

## Part One Sol Gel Chemistry and Methods

Sol-gel synthesis of metal oxide can be done at relatively low temperature compared to the solid-state reactions. In general, sol-gel process involves formation of sol from homogeneously mixed...

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The sol-gel method involves two main reactions: (1) hydrolysis of the precursor in the acidic or basic mediums and (2) polycondensation of the hydrolyzed products. In this way a polymeric network is formed in which MNPs can be retained [126]. View chapter Purchase book. Read full chapter.

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This process can be summarized in six steps: (1) the formation of a stable metal precursor solution referred to as "sol"; (2) the formation of a "gel" through a polycondensation reaction; (3) the aging of the gel for hours or days, resulting in the expulsion of the solvent, i.e., Ostwald ripening, and the formation of a solid mass; (4) the drying of the gel of any liquids; (5) dehydration and surface stabilization; and (6) heat treatment of the gels at high temperatures to generate ...

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The diverse, international team of contributing authors of this reference clarify in extensive detail properties and applications of sol-gel science and technology as it pertains to the production of substances, active and non-active, including optical, electronic, chemical, sensor, bio- and structural materials.

Handbook of Sol-Gel Science and Technology -  
Processing ...

Alkoxides are ideal chemical precursors for sol-gel

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synthesis because they react readily with water. The reaction is called hydrolysis, because a hydroxyl ion becomes attached to the silicon atom as follows:  $\text{Si}(\text{OR})_4 + \text{H}_2\text{O} \rightarrow \text{HO}-\text{Si}(\text{OR})_3 + \text{R}-\text{OH}$

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