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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 (i.e., formation of the gels) is due to the formation of covalent bonds between the sol particles. 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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Chemical ...

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

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