SiGNa CHEMISTRY

improving our world...
one discovery at a time

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SiGNa MATERIALS OVERVIEW

SiGNa Chemistry has developed three categories of alkali metal-nanostructured silica materials (M-SG) for greener chemical synthesis, as well as other stabilized alkali metal derived materials:

STAGE 0
(K_2Na, Na_2K, etc.)

Desulfurization
pyrophoric powders able to reduce Teflon in the solid-state.

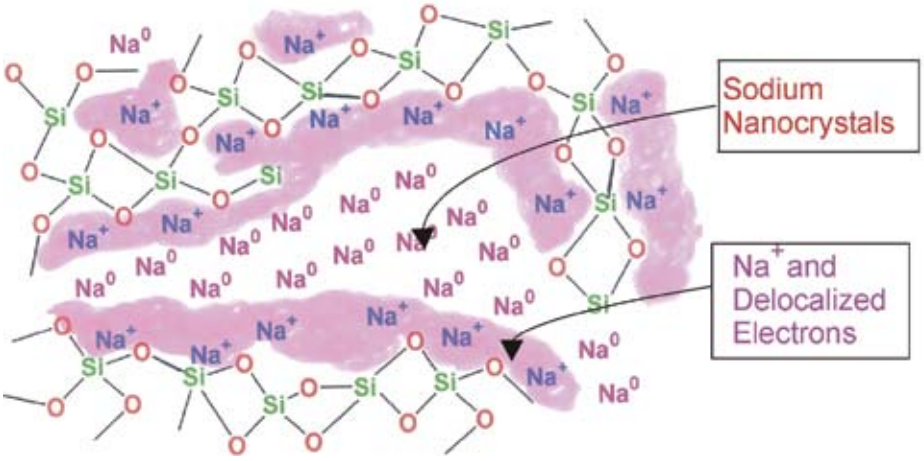
STAGE I
Liquid alloys and Na, K, Cs, Rb, etc.

Environmental Remediation, Pharmaceuticals & Industrial Chemistry
non-pyrophoric, free-flowing black powder with the reactivity equivalent to neat alkali metals, but usable in a safe solution process under ambient temperatures and pressures in green non-ammonia solvents (Figures 1 and 2).

STAGE II
Alloys and Na

Hydrogen Production and Hydrogenation Chemistry
nanocrystalline NaSi that reacts with water to produce high-pressure H_2.

Throughout the manufacturing process, all raw materials are completely integrated and no waste is generated, even the N_2 gas is recycled. Scale of manufacturing has been achieved at > 1 metric ton per batch.



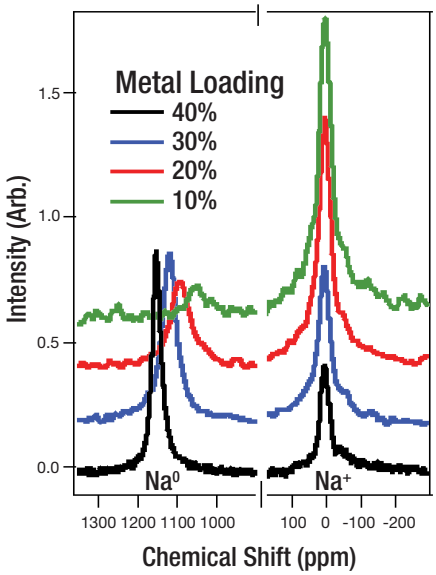


Figure 1. Possible Model of the Stage I M-SG (above)
Figure 2. ^{23}Na MAS-NMR of Stage I M-SG Effect of Loading (right)

Summary of Alkali Metal-Silica Gel (M-SG) Materials

- A loose, free-flowing, air stable powder loaded with up to 40 wt.% alkali metal. They are easy to produce and safe to handle - even stable in dry air. The powders can be utilized in both batch and continuous reactions using greener manufacturing solvents (non-ammonia) at room temperature and pressure. The by-products and waste are non-toxic and environmentally safe (sodium silicate) with an infinite shelf-life.

- Usable for chemical reactions, such as: 1) Birch reductions; 2) Deprotections; 3) Environmental Pollutant Destruction (PCBs and CFCs); 4) Radical carbon-bond forming reactions; 5) Phosphine reductions; 6) Desulfurization; 7) Polymerization; and many others.