

# Recycling and regeneration of spent refractory in ironmaking and steelmaking industry

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## Abstract

Along with the rapid development of ironmaking and steelmaking industry in China, the usage of refractory is being increased drastically, which has beyond to 9 Mt, and total amount of spent refractory achieved to 4 Mt, it means that about 0.45t new spent generated for each refractory consuming. However, most of spent refractory are deposited on land surface without any utilization, which pollutes environments seriously. Some heavy metal ions in spent refractory (containing Fe, Cr, Zr and so on) may permeate into the soil nearby, cause soil alkalinity, swampiness, pollute the subterranean waters. A few of spent refractory has been ground and reused as chamotte. However, major chemical compositions such as Si, Al, Mg, Ca et al. in spent refractory are valuable elements, which can be recycled or regenerated to produce high performance materials by chemical design and synthesis.

In this paper, several spent refractories in ironmaking and steelmaking industry have been recycled and regenerated. Based on phase diagram and thermodynamics,  $\beta$ -SiAlON composites were produced from spent  $\text{Al}_2\text{O}_3$ -SiC-C castables and coal gangue by carbonthermal reduction nitridation method under various atmospheres (such as air or nitrogen of different purity); Regenerated MgO-CaO brick samples were prepared using spent MgO-CaO bricks from AOD furnace and fused magnesite as raw materials under insulating or normal air atmosphere. The phase, microstructure and performance of those recycled or regenerated materials have been characterized in detailed, and their mechanical property were measured and compared with that of pure raw materials subsequently.

**Keywords:** spent refractory, recycling, regeneration

**Note:** the topic from list above would be preferred to oral presentation.

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