IMPRINT

Publisher and publishing house:
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Aachener Str. 172, 40223 Düsseldorf, Germany
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www.expert-fachmedien.de, www.interceram-refractories.info
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Owner of title rights: DVS Media GmbH, Düsseldorf

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Subscription charges 6 magazines:

Print:	233,– € + shipping costs 21,– € (Germany),
	233,– € + shipping costs 27,– € (foreign countries)
Print + Online:	277,– € + shipping costs 21,– € (Germany)
	277,– € + shipping costs 27,– € (foreign countries)
Online:	144,50 €
Single issue:	42,50 € + shipping costs

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Expert Fachmedien GmbH
D-40223 Düsseldorf, Germany

ISSN: 0020-5214
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Dear Refractories Colleagues and Readers,

There is a Chinese saying "Qiao Fu Nan Wei Wu MiZhi Chui", that means "even the cleverest housewife cannot cook a meal without rice". In the refractories industry, raw materials are similarly recognised as its "lifeblood". They are critically important for producing consistently high quality refractory products, maintaining cost control and improving profit potential.

When I was in the university about 30 years ago, there was a commonly shared belief that future generations of refractories would be produced using the so-called three "highs": high grade raw materials, high pressure shape forming and high temperature sintering. The last two principles were actually closely related to the first one. At that time, people often "intuitively" intended to use high grade (e.g. highly pure fused) raw materials and pay much less attention to lower grade materials in achieving all three "high" conditions.

Unfortunately, high grade deposits are gradually being exhausted, which, along with ever-increasing raw material prices, are having a very negative effect on the whole refractories industry. China is the major source of the most important refractory raw materials (e.g. bauxite, fused magnesia, graphite and brown fused alumina). However, supplies from China have declined significantly in recent years for various reasons, one of which is steady exhaustion of high grade raw materials. This, along with price increases, squeezes profit margins and threatens the sustainability of the refractories industry.

It is now time for refractories researchers/manufacturers to start considering this issue seriously and take necessary measures to respond to these challenges. First, we should make sure that we use high grade raw materials in the most sensible and effective ways. Use of high grade raw materials will not improve the service lives of refractories in all cases since the performance and durability of refractories depend on a combination of multiple factors. We can illustrate this with some examples. It was found that refractories using less dense aggregates could have better corrosion resistance than dense aggregate refractories. MgO-C bricks containing high levels of graphite also may not perform as well for the ladle slag lineas their low carbon counterparts. Furthermore, MgO-C bricks containing Al antioxidants can perform worse than Al-free substitutes in some cases. Therefore, refractories researchers and producers should work together to ensure that the right types and proportions of high grade raw materials are used in each application. Second, we may have to consider using alternatives to replace some traditional raw materials. For example, hercynite can replace $MgAl_2O_4$ spinel to produce chrome-free bricks for cement kilns. As a third strategy, we could try to use recycled materials (i.e. reuse spent refractories) or convert waste materials generated by other industries into useful refractory materials. Finally, we could upgrade low grade raw materials by removing impurities or converting their suboptimal phases (e.g. SiO_2) to more refractory ones (e.g. SiC and Si_3N_4).

In this and previous issues, we have reported on recent raw materials-related research works. Although it would be impossible to fully address every aspect of the situation discussed above, we have provided our readers with very useful information on the subject and will continue to highlight the very latest advances in this area. Enjoy reading!

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