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Manufacturing & Performance of High-Temperature Materials

INTERVIEW – Imerys Aluminates/FR | **TECHNOLOGY NEWS** – Wonjin Worldwide/KR, Bricking Solutions/US, Refractories Testing/GB | **REPORTS** – Promotion and Support of Refractory Science/US, Virtual Refractories Minerals Forum 2021 | **TECHNOLOGY TRENDS** – Viscosity Changes of an Alumina Based Castable during Mixing, Formation of Hexa-Aluminate Solid Solution Phases in Spinel Containing Castables, Lime Kiln Refractory Failure Solution, Improved Explosion Resistance of Low Cement Refractory Castables

Phenol-Free Refractory Lining – Another Innovation for Better Workplace and Environment

A new eco-friendly refractory brick has been launched, in South Korea drawing attention from refractory and steel industries. Last March at a ladle station of the Korean steel company H Steel, everyone at the site including project staffs, workers and developers of the new product smiled brightly when ladle lining preheating reaching over 1100 °C as they couldn't smell typical resin odour at all with new phenol-free refractory bricks.

Fig. 1 Ladle brick lining

A staff member of the of H Steel company stated: "This phenol-free refractory brick reduces odour significantly without negative side-effect including heat resistance and wear resistances in comparison to traditional resin-bonded refractory product added. We started this project three years ago as there were few complaints over odour and growing demand on the better workplace for site workers including crane drivers as most of gas goes up in the air. Finally, this issue has been resolved successfully."

H Steel, the biggest EAF (Electric Arc Furnace) plant in South Korea, and D Steel launched the clean (odour-free) ladle lining project together with Wonjin Worldwide a multinational refractory manufacturing company.

"We were concerned about the smell from the plant and raised issue to the company, and now I appreciate for their effort to listen to our requirements seriously and actively try to resolve the problem," said the workers working for the H Steel plant and the D Steel plant.

The most common refractory lining for ladle is phenol resin-bonded brick with magnesia and carbon as well as alumina component. Historically, the resin-bonded brick was developed to replace the ordinary pitch-bonded brick in order to reduce emission of unfavourable gases. The resin-bonded brick is accepted as the industrial standard today. Despite resin-bonded bricks are manufactured with drying process around 250 °C to remove volatiles, remaining phenol substances still emits a small amount of various chemical substances during preheating with significant odour.

The new phenol-free technology has the significant advantage over the existing

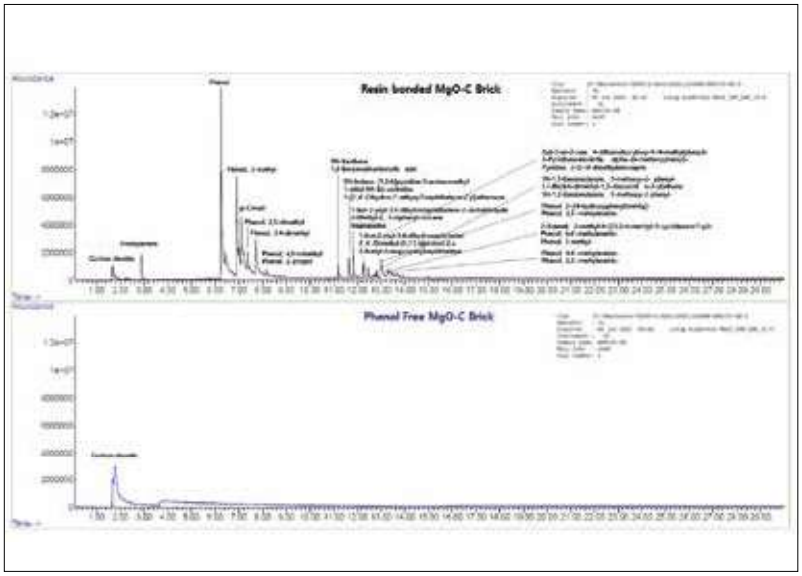

Fig. 2 Gas chromatography analysis result at 500 °C, conducted at the Korean Polymer Testing and Research Institute (Figs.: Wonjin Worldwide)

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technology as it doesn't emit any gases significantly other than carbon dioxide, nor require any further treatment, and the existing improved resin-bonded brick technology requires the further treatment with heat at higher temperature which is inadequate solution due to the higher cost as well as remaining resin components deep inside of bricks.

The staff of new technology team from Wonjin Worldwide, the refractory company mentioned: "The technology used for our phenol-free bricks is originally adopted from Japan which had taken the long time to be developed. This technology can't be unfriendly to human body neither smelly because we don't use any materials containing phenol or poly-aromatic hydrocarbon. We have put in lots of time and investment to make this product. The most difficult part of this development was to meet industrial standard in terms of quality and cost while the product is eco-friendly. We believe we are ready to go mass production soon."

He further prospected, that the company hopes, the new technology and concept of phenol-free ladle lining would spread fast to other steel plants and the whole industry. Wonjin Worldwide expects to become a new industry standard very soon.

Many believes quality of life and environment of work will be improved after the pandemic era, as the world faced many experiences during the crisis. Thus, well-being of work environment will become crucial value for all stakeholders of an enterprise. The first step of such inevitable movement has already been taken in Korea's steel industry in order to create sustainable value for the future – it is believed to be only a little step, but meaningful for a global trend.