Introduction of SEM technology is a winning choice

Berry Veltman, Process Engineer, Mosa

As a Dutch tile manufacturer with over 130 years of experience, Mosa offers unique and distinct tile concepts for walls, floors, facades and terraces.

Once Mosa began to work with a desktop SEM (scanning electron microscopy), it was a very brief span of time before this device the size of an old PC had proven its effectiveness. SEM has gone a long way toward helping Mosa achieve a significant step in its efforts to research the chemical nature of production faults.

Berry Veltman, who works in process technology in the floor tile factory, is an enthusiastic speaker. Not only does he explain with verve and conviction what SEM does, he also explains how the device puts an end to speculation about disruptions to production and how it can show us the "way to truth," as Barry puts it. The editorial office spoke with the 26-year-old chemist and tried to get to the bottom of how the SEM technology could deliver added value for Mosa.

How does SEM technology work?

"The sample we want to investigate is placed into a vacuum chamber, in which it is shot with a focused beam of electrons. By using detectors, it is possible to form an image with the "reflected" or "backscattered" electrons. The advantage of this image lies in its high magnification factor. Being able to magnify an image by up to 100,000 times enables us to see even the primary clay plates, which are just a couple of tens of nanometers thick. It even allows us to see the smallest pores that are present on the tile surface, which we would be unable to see with an optical microscope. We can also use this technology to conduct topographical analyses of features such as the roughness of a surface. However, the device's major advantage is that it enables us to conduct localized chemical analyses on, for instance, an impurity which causes our end products to be rejected. This means that we can carry out more targeted improvements in the production process, which in turn allows us to reduce the number of defective tiles."

What do you mean by "defective" tiles?

"One of the most important things for us as a tile producer is that we maintain constant quality in our tiles. However, removing defective tiles from the process at the end of the production process is a costly procedure. In 2015, an average of 91.9% tiles produced in VTF were approved the first time round. In the past, investigating the origin of these faults was often problematic; whilst there would be lots of discussion, hard facts and evidence were often lacking."

Could you give us a concrete example?

"One of the frequently occurring problems is minuscule irregularities in the top layer of our tiles. You could imagine these as minuscule nodules. These are a recurrent problem, and we assumed that they were linked to inhomogeneous features. SEM enables us to carry out a chemical analysis of these nodular defects. This technology has provided us with the answer to questions such as: What is the chemical nature of these nodules or cavities? In which component of the production process can the cause be identified? What is the mass's composition

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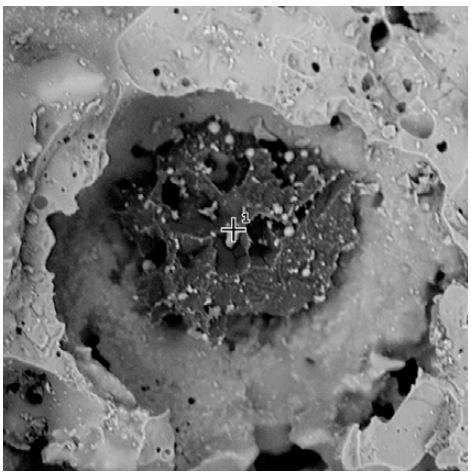
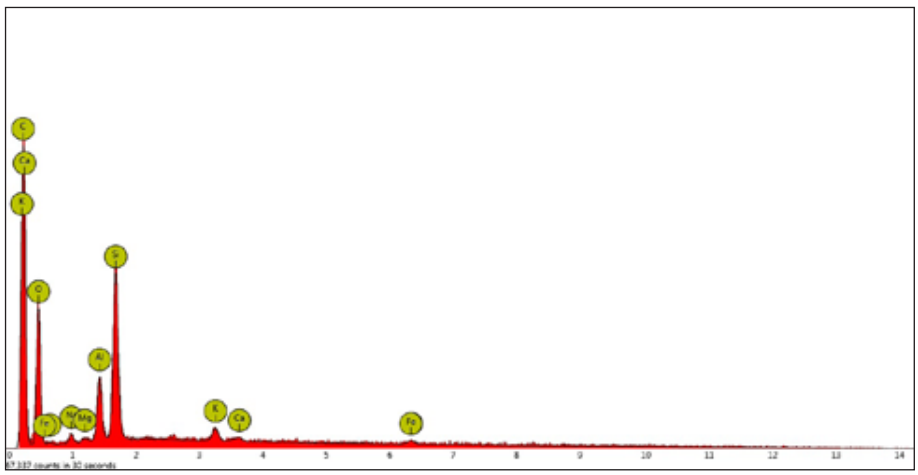
at that point and to what extent does this deviate from the rest of the top layer? In the past, we were often unable to answer similar essential questions. Thanks to SEM technology, we have been able to conduct analyses in greater detail and identify increased concentrations of carbon or iron in many cases with similar nodular defects. Thanks to these analyses, 2016 saw the beginning of a project which uses magnets to effectively remove iron from these masses."

But carrying out analyses is surely nothing new?
"That's true, but SEM enables us to conduct analyses up to a nanoscale. What's more, the device also provides us with information about the material composition of the nodules. This information is used to investigate whether the composition contains unusual substances, whether there's an excess of a certain substance, or whether the concentration of a substance deviates from the norm. Data such as this is essential in order to understand and tackle the problem."

Together with his colleague Stan Szreder, Berry Veltman is applying the SEM technology in various research projects. The duo say that SEM technology can be used in many areas and is in no way restricted to analyses on samples. Both chemists are convinced that the device can make a substantial contribution to the optimization of the production process.



Pollution in carbonic irregularity in floor tile



Analysis spectrum with peaks which are characteristic of the measured elements

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Mosa
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