

## Case study of suspected mold growth in finished shoes

### I - Introduction

Mold growth can impact the appearance and quality of products, leading to the formation of mold stains. These stains typically develop on the product's surface, causing irregular discoloration. Various species of molds can produce mold spots with different colors on specific materials. This not only diminishes the product's visual appeal but also holds the potential to cause irreversible contamination such as staining, fading, or deterioration due to secondary metabolites produced by mold growth.

However, not all spots on products are the result of mold growth. **One specific occurrence that may resemble mold but isn't caused by mold growth is known as "rubber blooming."** Rubber blooming refers to the formation of a white substance on rubber materials under specific conditions. This phenomenon often affects products made from natural rubber, styrene-butadiene rubber, and other rubber-based items. Its appearance closely

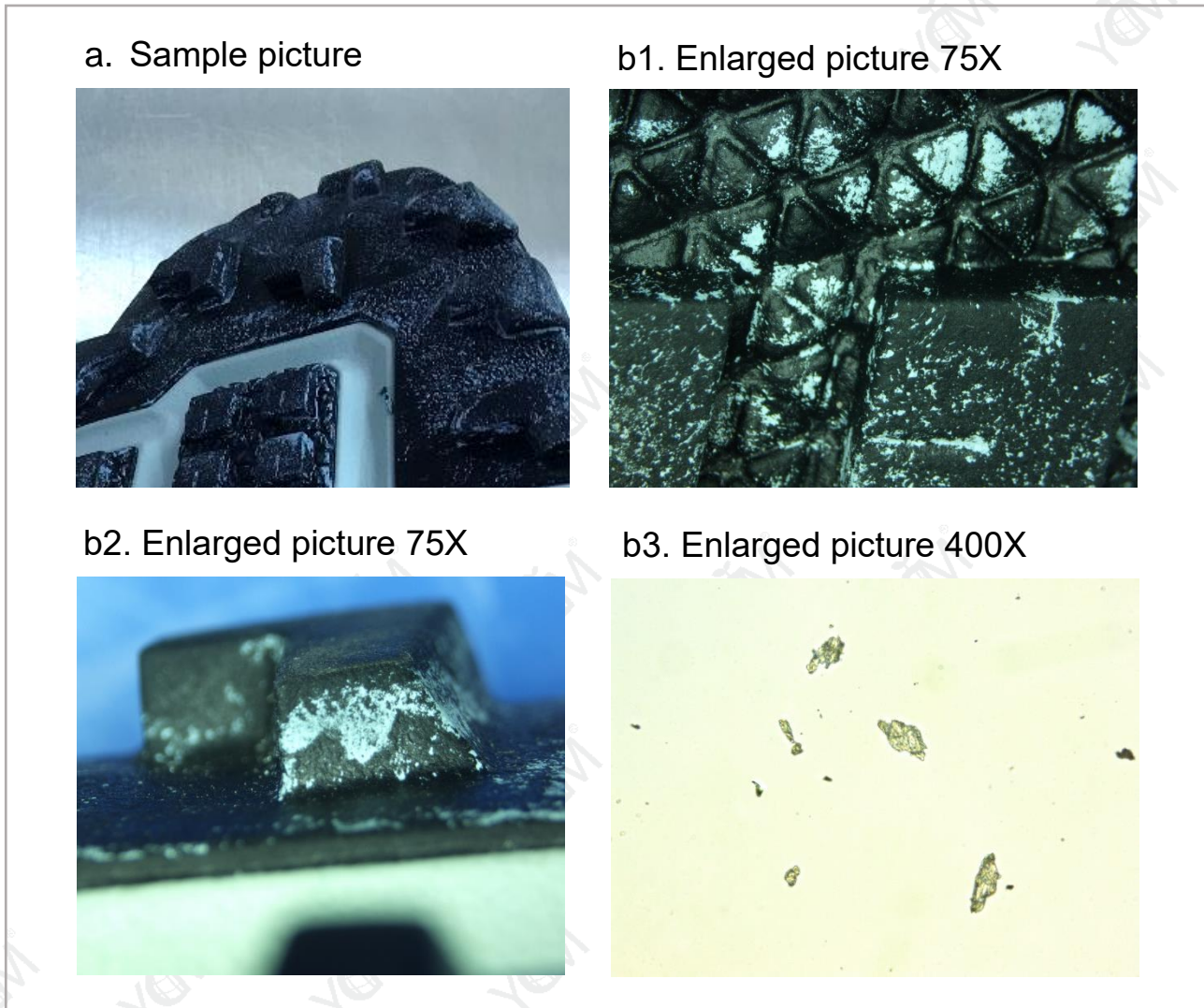
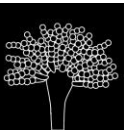
resembles that of mold, which can lead to misconceptions. **Rubber blooming can have various causes, including excessive use of additives, rapid temperature changes, incomplete vulcanization, or other external factors that disrupt the material.** Additionally, higher ozone concentrations during the summer can contribute to rubber blooming.

The background of this case involves Brand C's finished shoes showing a white substance on the sole that resembles mold growth. Consequently, they have commissioned the YCM Mold Research Center (MRC) to conduct tests to determine whether the issue is indeed caused by mold growth.

---

### II - Result

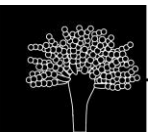
The finished shoes provided by Brand C exhibit visible white speckled contamination. After testing by the YCM MRC, no evidence of mold growth structures was detected (Figure 1).



**Fig 1. Finished shoes submitted for testing by Brand C**

a. Finished shoes from Brand C suspected of mold growth on the sole.

b1 - b3. Observation of Brand C's finished shoe sole under a microscope at different magnifications revealed no evidence of mold growth structures.



### III · Conclusion

The finished shoes from Brand C, suspected to have mold growth on the sole, were tested by the YCM MRC, which determined that to have no mold growth. The white spots on the sole cannot be removed through physical means, and wiping with a cleaning agent did not result in any staining on the wiping cloth. Therefore, **the spots are not caused by discoloration**. Furthermore, even after temporary removal with a cleaning agent, **the white spots reappear over time**. As a result, it is inferred that the formation of these white spots may be attributed to a **material alteration in the outsole, specifically the phenomenon of "rubber blooming."**

The underlying causes of rubber blooming on the shoe's sole encompass several factors, including microcracks on the rubber surface, incomplete vulcanization reactions, and external

forces damaging the rubber surface. These factors might lead to the formation of tiny white particles in certain areas of the rubber material. These particles tend to aggregate in specific locations, resulting in the appearance of white spots that can easily be mistaken for mold growth.

Whether it's mold growth, rubber blooming, or any other phenomenon **causing damage to product quality and resulting in cost losses and environmental harm, it is often worth investigating**. Therefore, it is advisable to entrust the analysis to a professional testing entity like YCM Mold Research Center. By identifying the root causes of quality issues and implementing appropriate measures, product quality problems can be eradicated, ensuring the health of your products.