

Material compatibility of mikrozid® universal wipes with portable communication devices

Introduction

The goal of this study is to determine the suitability of mikrozid® universal wipes for the surface disinfection of portable communication devices. This is investigated in a practical test with a representative selection of devices which are subjected to 640 disinfection cycles each. During the test, the devices are checked for visible changes and malfunctions.

Material and methods

- mikrozid® universal wipes

- Tablet	Asus / Google	Nexus 7	(1)
- Smartphone	Sony Ericsson	Xperia X8	(2)
- Smartphone	HTC	Desire	(3)
- Smartphone	Samsung	Galaxy Young	(4)
- Smartphone	Apple	iPhone 4	(5)
- Smartphone	Blackberry	Bold 9000	(6)

Test objects 1, 3 and 5 have a nano-coated touchscreen-surface.

Test preparation

At the time of testing, the final product (softpack with 100 pre-soaked 20 x 20 cm wipes) was not yet available. Therefore, testing was carried out with schülke wipes (roll with 100 wipes in the schülke wipes dispensing tub). With a size of 30 x 30 cm, schülke wipes are markedly larger than mikrozid® universal wipes, however, they are made of the exact same fleece material (100% polyester, 48 g/m²). The schülke wipes are soaked with 1.6 liters of mikrozid® universal wipes solution, which corresponds to about 4 times the weight of the dry wipes. This ratio was chosen since it's the same fleece material weight to disinfectant solution ratio as in the final product.

After filling the dispensing tub, the tub is tilted and turned multiple times in order to achieve an even distribution of the disinfectant solution across the wipes. This procedure is repeated twice a day.

Test methods

Before the first disinfection cycle, the technical functions of each device are tested, their visual appearance is documented by photographs, and the devices are weighted.

A new (unused) wipe is used for each device and each disinfection cycle. Each disinfection cycle is carried out in the same order. First, the back of the device is wiped, followed by the front and then the sides. It is made sure that during disinfection, no excessive amounts of solution are applied to the devices. Special care is being taken, that no solution enters the devices via the connectors at the sides.

After each disinfection cycle, the devices are left to dry on a stainless steel grid, in order to allow the device to dry evenly on all sides including the bottom. The drying time between two disinfection cycles is always at least 15 minutes.

The 640 disinfection cycles are carried out between August 4th and December 1st 2015, which corresponds to roughly 8 disinfection cycles per working day. After 320 disinfection cycles, the devices are charged overnight and tested for basic functionality. At the end of the test, after 640 cycles, the devices are subjected to comprehensive functional testing

- chargeability of the battery (short circuit)
- start-up and logon to the cellular network (operating system, radio module)
- testing of the controls (volume controls, home button, touchscreen, keyboard, trackball etc.)
- outgoing and incoming calls (connection, microphone, speaker)
- starting the internet browser and performing an internet search (cellular data connection and transfer)
- establishing a Wi-Fi connection, starting the internet browser and performing an internet search (Wi-Fi connection, data transfer via Wi-Fi)
- playback of a music video from the internet with sound via the build-in speakers and via headphone (fast data transfer via Wi-Fi, video processing, screen, speakers, headphone jack)
- taking a photograph and transferring it to another device via Bluetooth (camera, memory interface, connection and data transfer via Bluetooth).

Results

No significant amounts of product residues build up on the devices. On the nano-coated touchscreens, the product residues form a few hardly visible tiny spots on the surface of the touchscreen upon drying. On the touchscreens without nano-coating, the product leaves some very minor streaks upon drying. Both phenomena can only be seen when the display is turned off and more importantly don't get any worse over time (during each disinfection cycle, the residues from the previous disinfection are "automatically" being wiped off). The water repellent properties of the nano-coatings of devices 1, 4 and 6 remain fully intact throughout the 640 disinfection cycles.

Figures 1 through 6 show the tested devices before (left) and after (right) the 640 disinfection cycles. The only noticeable difference is the partial disappearance of the SD-card logo on the side of the Blackberry device (Figure 6, side view). Even the slight defects in the housing of the HTC Desire, which are already visible at the start of the experiment and which are a weak spot with regard to further damage, don't reveal any visible changes after 640 cycles.

The color differences between the before and after pictures are not due to actual color changes of the devices, but are due to differences in lighting and in white balance of the camera (this can also be seen from the fact that the background shows the same color change as the devices).



Fig. 1. Asus / Google Nexus 7 tablet before (left / top) and after (right / bottom) 640 disinfection cycles.



Fig. 2. Sony Xperia X8 smartphone before (left / top) and after (right / bottom) 640 disinfection cycles.





Fig. 3. HTC Desire smartphone before (left / top) and after (right / bottom) 640 disinfection cycles.



Fig. 4. Samsung Galaxy Young smartphone before (left / top) and after (right / bottom) 640 disinfection cycles.



Fig. 5. Apple iPhone 4 smartphone before (left / top) and after (right / bottom) 640 disinfection cycles.





Fig. 6. BlackBerry Bold 9000 smartphone before (left / top) and after (right / bottom) 640 disinfection cycles.

Opening the back cover of the devices (only possible for devices 2, 3, 4 and 6) after the 640 disinfection cycles revealed no signs of product solution having leaked into devices. In line with this finding and the lack of visible changes to the devices, no significant weight changes were observed. All devices show a minimal weight loss in the range of 30 mg (90 mg for the Google Nexus tablet). This corresponds to less than 0.05% of the total weight and is considered absolutely non-critical.

Device	Asus	Sony	HTC	Samsung	Apple	Blackberry
battery charging	●	●	●	●	●	●
start-up / cellular network logon	● / -	●	●	● / - ¹	●	●
controls	●	●	●	●	●	●
calls	-	●	●	- ¹	●	●
cellular data	-	●	●	- ¹	●	●
Wi-Fi data	●	●	●	●	●	●
video playback (video / sound)	●	●	●	●	●	●
photography (camera / memory)	●	●	- ²	●	●	●
Bluetooth transfer	●	●	●	●	- ³	●

¹ Testing not possible, SIM locked device

² The camera was already non-functional at the start of the test

³ The Bluetooth transfer of files could not be tested, since the Bluetooth transfer of files from Apple devices to devices of other manufacturers is not supported by iOS.

Discussion

Since the mikrozid® universal wipes disinfectant solution contains several non-volatile components, slight amounts of visible residues remain on the surface upon disinfection and drying. However, the amounts of residues are so small, that these are only visible on large even surfaces such as displays. Even on displays, the residues are only visible as long as the screen is dark. It's advantageous that residues do not accumulate on the treated surfaces. During each disinfection cycle, the residues from the previous disinfection are readily removed from the surface. After the

640th disinfection cycle, no more residues are found on the treated surfaces than after the first disinfection cycle. There are no signs of product solution entering the devices via gaps (e.g. between buttons, keys or the battery cover). Even after 640 disinfection cycles, not a single malfunction has occurred, which further supports the idea that no serious amounts of disinfectant solution enter the devices.

On one of the devices (Blackberry Bold 9000), one single print on the left side of the housing has partly disappeared during the course of the 640 disinfection cycles. It is likely that this was at least in part caused by the mechanical action and not solely due to the composition of the product. Apart from this, none of devices show any visible changes to the material or surfaces.

Conclusions

mikrozid[®] universal wipes are very well suited for the disinfection of portable communication devices such as tablets and smartphones.

No accumulation of product / product residues on the treated surfaces can be observed. Furthermore, there are no signs of product entering the devices. The repeated disinfection with mikrozid[®] universal wipes causes neither visible nor measurable material changes and doesn't cause any malfunctions.

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Schülke & Mayr GmbH
Research & Development
Application Department Hygiene International



Dr. Frank Bakker



Rolf Kleinwort