

USE OF DIAMOND POWDER IN THE IONIZATION PROCESS

PAULINA BRZECKA¹, ANNA JANASZCZYK¹,
MAREK CHUCHRACKI¹, KATARZYNA MITURA²

¹ PWSZ IN KALISZ, MEDICAL FACULTY,
KASZUBSKA 13, 62-800 KALISZ, POLAND

² KOSZALIN UNIVERSITY OF TECHNOLOGY,
DEPARTMENT OF BIOMEDICAL ENGINEERING,
ŚNIADECKICH 2, 75-453 KOSZALIN, POLAND

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Introduction

Iontophoresis, also known as ionization, is a medical treatment with the use of electric current. It consists in introducing ions into the epidermis and uses the electrolytic dissociation phenomenon, that is the separation of molecules into positively and negatively charged ions. Iontophoresis transports small molecules of active substances in low current electric field and introduces substances in the form of ions into the skin.

Materials

Diamond powder with a diameter of 2-4 nanometers.

Method

The use of direct current increases the ND penetration. Electro osmosis leads to larger ND ions diffusion into the epidermis. Ions, after penetrating stratum basale epidermis keep diffusing into the deeper layers of epidermis for 24-48 hours. After the procedure the explicit biocompatibility of ND was ascertained.

Results and Discussion

The process of iontophoresis enabled answering the question of ND's biocompatibility. After the procedure several pictures were taken with video dermatoscope before and after the usage of ND. Skin penetrations reach the deeper layers of the epidermis. The diamond powder has an antioxidant effect and is biocompatible.

Conclusions

After the first visual clinical evaluation of the skin, no contact lesions were observed. After exposing the preparation to the skin, no change in the immune mechanism was demonstrated.

The additional measurable aspect was high hydration level of epidermis after the procedure. The measurement was made with the use of corneometer.

Acknowledgments

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References

- [1] K. Mitura, P. Niedzielski, G. Bartosz, J. Moll, B. Walkowiak, Z. Pawłowska, P. Louda, M. Kieć-Świerczyńska, S. Mitura: „Interactions between carbon coatings and tissue”, *Surface and Coatings Technology*, 201, (2006), 2117-2123.
- [2] D. Bociąga, J. Grabarczyk, P. Niedzielski, M. Krakós, K. Mitura: „Application of biomaterials with Carbon Coatings for Body Piercing”, *Engineering of Biomaterials*, 43-44 (2005) 66-70.

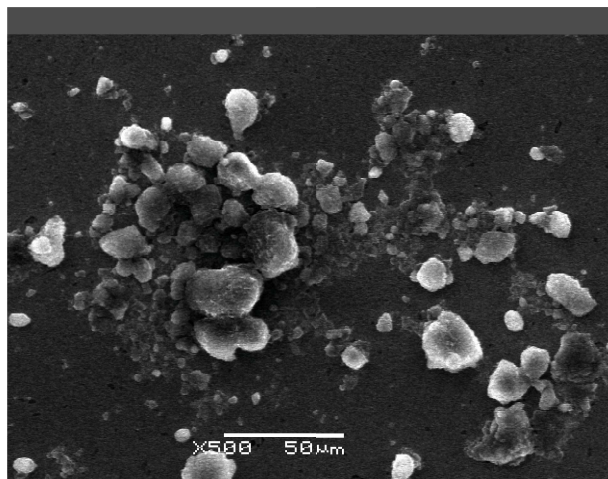


FIG. 1. SEM image of three-dimensional (3-D) structure of detonation nanodiamond particles (JEOL JSM-5500LV).

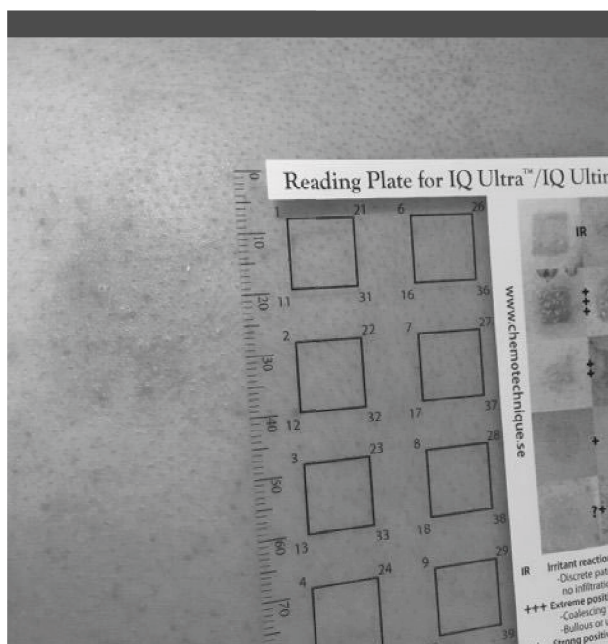


FIG. 2. Allergic reaction to cathode.

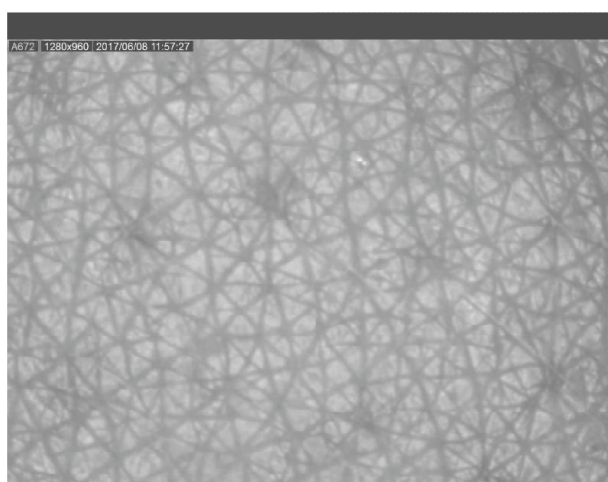


FIG. 3. No allergic reaction.