



# Compositions "Nanosilica – Mineral Fillers – Epoxy Resin" For Out-Clinical Dental Prevention and Self-Treatment of Carious and Traumatic Dental Damages

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**Abstract:** In our new experimental works, the existence of highly filled epoxy-mineral compositions capable of filling and restoring damages of teeth, outside of clinical conditions, is shown. These hypotheses found confirmation in the obtained results of dental repair on volunteers. The tooth powders and epoxy-composites from cheap available components, for use by non-specialists in domestic and non-clinical conditions – were developed and proposed. These results will be very useful for people and communities who, for various reasons (wars, out-cities, voyages, poverty, workload), are left without access to quality dental services.

### Review Paper

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## INTRODUCTION

The main direction in modern dentistry should be the prevention of dental diseases, and their treatment with minimal surgical intervention. And the quality of these materials is constantly improving. However, practical dentistry remains conservative, based on improvement on traditional methods. Dentistry has experienced a rebirth - with emergence of new polymeric materials - polymer cements (1960 - 70's) and late – photopolymers (1980-90's). Many other polymer matrices, (polyepoxides etc), were not considered then. Meanwhile, polyepoxides has unique restorative potential no only in engineering but medicine (prosthetics, gluing, etc.).

Our Chuiko Institute of Surface Chemistry developed first in USSR/world acrylic photopolymer compositions for prosthetics and filling [1-3]. We already have a positive experience in creating prophylactic powders for damaged teeth [4]. Now, work on the creation of epoxycomposites for dental-fillings

represents a new special cycle, which has no analogues in the world dental science.

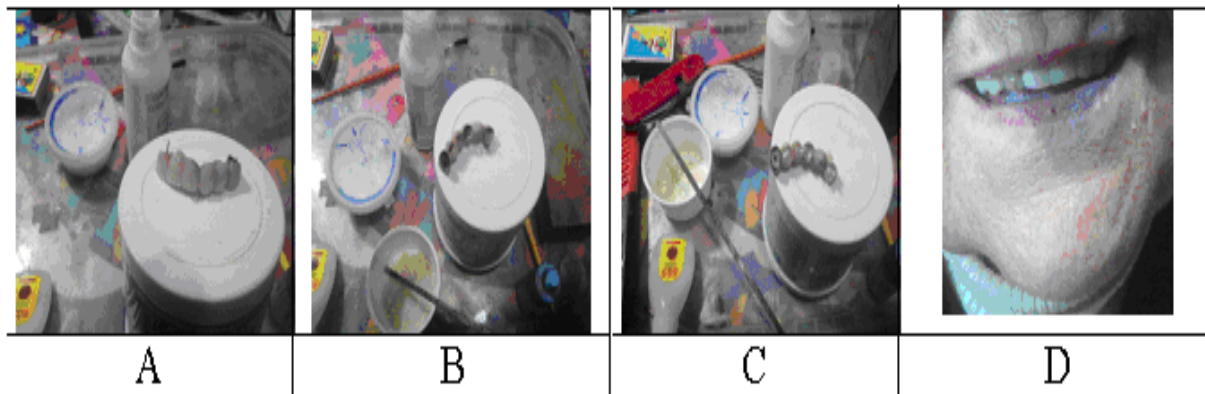
### Experimental part

The first experiments on non-clinical (including self-tested) filling and gluing of chipped teeth were carried out. Composition Epoxy520+ PEPA hardener (5:1) was filled with 65% of white-cement, and was kept for 3-4 h until a semi-solid consistency. After that, the composition was suitable for strong adhesion with a wet tooth surface. And the preparation procedure of tooth (or crown) surface is maximally simplified - it is limited to pre-rinsing and wiping with antiseptic. The filling applies with a pressure and holding for 1-2 minutes. After that, the patient personally self-corrected the bite and shape of the filled/glued part of the tooth. Subsequently, for 5-7 hours (for a night's sleep etc), the operation site remained at rest, with several self-corrections.

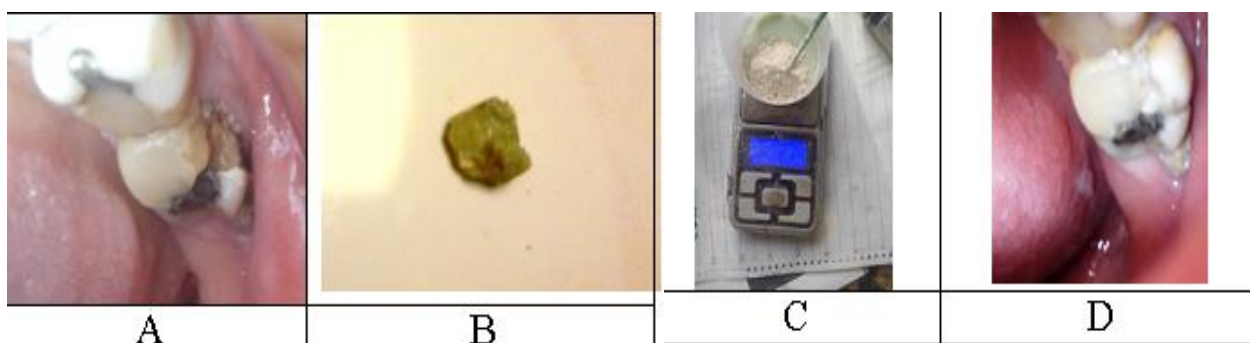
Figures 1-3 shows examples of restorations implemented in 2020-2021 by our epoxy-composites.

As a result of the tests, it was found that these compositions can effectively glue the fallen fragments of dental crowns, artificial jaws or teeth (Fig 1). They hold well in this position and withstand all loads. They are no less effective when gluing fallen fragments of

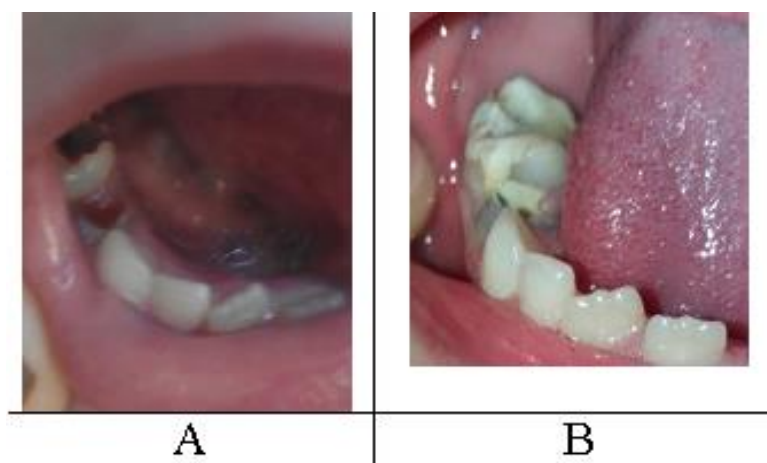
living teeth - for example, broken or broken ones (Fig 2). These restorations may require repeating the gluing procedure (under errors or non-optimal post-curing process), after which the composite is firmly embedded and well withstands dental loads for many years (Fig 2).



**Fig 1: The drop-down “crown” of a old patient, in the states - initial (A), prepared (B), smeared with the composition (C), and inserted back (D)**



**Fig 2: Damaged (A) by a marginal chip of enamel (B) and rejected for further treatment of the 7th tooth of a man; filling composition (C); restored tooth one month after the chip was glued back (D)**



**Fig 3: Extreme milk teeth (molars) of a schoolgirl in a completely degraded condition (A), and their appearance after a month of self-filling (B)**

It is effective to use these compositions in home and family conditions for the restoration of damaged children's teeth (Fig 3). At the same time, an

important problem is solved - the fear (or even panic) of the child in the doctor's office. Figure 3 shows an example of a completely destroyed tooth 4 and a

severely affected molar 5. They were not accepted for treatment by any doctor and were sent for urgent removal (because they were periodically sick). But after restoration at home (by our parents during our observation), the polyepoxy mass stood firmly on the affected surface. At the same time, the ideal bite-

compatibility with the upper teeth was restored, respectively, the problem of chewing was solved. Such an operation (Fig 3) has been successfully performed on the teeth of several patients.

The effectiveness of these composites is seen from Table 1.

**Table 1: The recorded effects according to the results of the first out-of-clinical restorations with epoxy composites**

	Positive	Negative
Filling of dental holes / caverns	6	0
Chip restoration	4	1
Crown restoration	2	0

## CONCLUSIONS

The highly filled epoxy-mineral compositions capable of filling and restoring dental lesions and mechanical damages, outside of clinical conditions, are obtained. The resulting composites are cheap, available and harden in the conditions of the dental cavity into biocompatible polymer fillings of high strength and resistance. This allows them to serve for a long time. These results will be very useful for people who, for various reasons (remoteness from cities, voyages, poverty, workload, war), are left without access to dental services.

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