MORTAR PE BAZĂ DE NANOMATERIALE PENTRU CONSERVAREA FAŢADELOR CONSTRUCŢIILOR
NANOMATERIALS-BASED MORTARS FOR BUILDING FAÇADES PRESERVATION

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In the field of architectural restoration, ancient materials and their decay in aggressive environments are studied, through case-histories. Some properties (capillarity, porosity) are tested on different façade surfaces, in order to identify the existing materials and to select the proper materials useful for restoration. The achieved microscopy (MO, AFM) studies allow observing the presence of the main weathering signs and the previous consolidation results. The EDXRF and ICP-AES techniques offer informations about the elemental composition of sample, while GC-MS allow the identification of the previous coniferous resins from the glue used for restoration. The identification of mainly of terpenes and derivative patterns highlighted the presence of plant oils and pine resins. Also, the CIELAB color parameters are a proof of the efficacy of the conservation process. Moreover a comparison between traditional mortars (based on cement) and those based on nanomaterials (calcium hydroxide, hydroxyapatite and their controlled mixture) used in restoration are investigated in this paper.

În domeniul restaurării arhitecturale, prin intermediul unor studii de caz sunt analizate materialele vechi, precum şi dezintegrarea lor în medii agresive. Unele proprietăţi (capilaritate, porozitate) sunt testate pe diferite suprafeţe de faţadă, în scopul identificării materialelor constituente şi selecţiei materialelor utile în restaurare. Studiile de microscopie (MO, AFM) realizate permit observarea principalelor semne de alterare şi a rezultatele consolidării cu diverse materiale. Tehnici precum EDXRF şi ICP-AES oferă informaţii asupra compoziţiei elementale a probei, în timp ce GC-MS permite identificarea răşinilor de conifere din adezivii utilizaţi anterior pentru restaurare. Identificarea terpenelor şi a derivaţilor acestora evidenţiază prezenţa uleiurilor vegetale şi a răşinilor de conifere. De asemenea, parametrii de culoare CIELAB reprezintă o dovadă a eficacităţii procesului de conservare. În plus, în această lucrare este investigată comparaţia dintre mortarele tradiţionale (pe bază de ciment) cu cele bazate pe nanomateriale (hidroxid de calciu, hidroxiapatită şi amestecul lor controlat) utilizate în restaurare.

Keywords: nanomaterials; façade presertvation; analytic characterization.

1. Introduction

For conservation/restoration of different buildings from national/international patrimony, different materials have been used, many of them being from regional raw materials [1]. In this way, there is a polemic discussion about the type of the materials used for restoration materials, either traditional materials (stone, brick, wood, mortar and plaster) and new innovative materials (polymers, resins, concrete), taking into acount their huge applicability and aestetic value, and their short lifetime [2]. Among the historical mortars, gypsum, lime and lime pozzolana have been used as binding materials. As aggregate material, river sand, pebbles, brick pieces and powder have been used together with hay, horse hair, goat hair which have served as fibers [3].

Depending on the building substrates, the restoration mortars were different, and in this paper we will discuss a study case - the Ensemble Basarabi, dated IX-XI centuries. The Basarabi Chalk Churches Assembly is part of the Roman career, part of the hill Tibişir on the outskirts of Murfatlar (Basarabi), 20 km before Constanţa. This rupester monument includes churches, galleries branched vaults, housing the tombs [4]. The stone is chalk, amorphous calcium carbonate, almost pure, soft, with high porosity and very hygroscopic. After discovery in 1957 and 1958, the monument supported different conservation/restoration operations, some of them being completely negative:

1. A protective concrete construction was partially completed and the rest of the monument remains in front of advanced degradation induced

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