

## O KONTINENTALNIM KARBONATIMA: BIGAR VS. TRAVERTIN

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### **Ključne reči: bigar, travertin, brzina taloženja, stabilni izotopi**

Kontinentalni karbonati, koji se talože iz slatkih voda bogatih kalcijum bikarbonatom obuhvataju sledeće sedimentne stene: bigar, travertin i pećinski nakit. Fokus ovog rada je na razlikama između prva dva, kako je u domaćoj literaturi razlika uglavnom bazirana na teksturnim karakteristikama i temperaturi vode iz koje se kalcijum karbonat taloži. Bigar je jako porozna, šupljikava stena, dok je travertin kompaktniji i veoma često laminiran. Takođe, opšte je poznato da se bigar taloži iz hladne, uglavnom rečne vode, a travertin iz tople. Temperatura vode ima direktan uticaj na diverzitet flore i faune, pa će ona uz bigar biti bujna, dok je kod toplih voda organski svet ograničen na određene vrste bakterija. Cirkulacija toplih voda iz kojih se taloži travertin omogućena je preko pukotina ili raseda, pa su pojave travertina kontrolisane lokalnom tektonikom, dok su pojave bigra vezane za klimatske uslove. Osim ovih, parametri koji definišu sedimentnu stenu kao bigar ili travertin su brzina taloženja i odnosi stabilnih izotopa kiseonika i ugljenika. Bigar karakteriše srednja brzina taloženja (nekoliko milimetara godišnje), dok travertin karakteriše velika brzina taloženja (preko nekoliko decimetara godišnje). Stabilni izotopi ugljenika definišu kontinentalne karbonate na taj način što će  $\delta^{13}C$  vrednosti biti negativne za bigar, a pozitivne za travertin. Razlog tome leži u činjenici da je bigar obogaćen lakšim izotopom ugljenika, a travertin težim. Kako odnosi stabilnih izotopa kiseonika direktno zavise od temperature vode, njihov značaj je nedvosmislen. Teksturane karakteristike jesu posledica svih ovih parametara, ali nije redak slučaj da porozna stena prema istim odgovara travertinu, a kompaktna laminirana stena bigru. Takvih primera ima i na području Srbije (bigar reke Sopotnice, kompaktna laminirana stena, ali izotopski odnosi odgovaraju bigru). Kada su u pitanju recentni sedimenti ovaj disbalans ne predstavlja problem, ali kod fosilnih akumulacija trebalo bi izbeći nazive "bigar" i "travertin", pogotovu ako su isti dati samo na osnovu teksturnih karakteristika.

## **ABOUT TERRESTRIAL CARBONATES: CALCAREOUS TUFA VS. TRAVERTINE**

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Terrestrial carbonates, which are excreted from fresh calcium bicarbonate-rich waters, include the following sedimentary rocks: calcareous tufa, travertine, and speleothems. Focus of this paper is the differences between calcareous tufa and travertine. In domestic literature, difference between tufa and travertine is usually based on structure and water temperature. Tufa is very porous rock, while travertine is more compact and laminated. Furthermore, it is known that tufa precipitates from cold streams, whereas travertine precipitates from warm waters. Temperature of water has strong influence on diversity of living organisms. Tufa deposits are followed with luxuriant vegetation and diversity of fauna, whereas in hot waters the assemblage of living beings is limited to some bacterial species. Circulation of hot, "travertine-bearing" fluids is enabled throughout fissures and faults, thus, travertine deposits are controlled by local tectonics and tufa deposits are driven by climatic conditions. Next to these parameters which define sedimentary rock as tufa or travertine are the deposition rate and ratio of stable oxygen and carbon isotopes. Tufa is characterized by medium deposition rate (up to few millimeters per year), while travertine is characterized by high deposition rate (up to few decimeters per year). Values of  $\delta^{13}\text{C}$  will be negative for tufa and positive for travertine. The reason is that tufa is enriched in light  $^{12}\text{C}$  isotope and travertine is enriched in heavy,  $^{13}\text{C}$  isotope. Due to fact that the ratio of stable oxygen isotope is directly influenced by water temperature, their importance is unambiguous. Structure is a consequence of those parameters, but it is not uncommon that porous rock considers travertine and that compact laminated rock considers tufa. Those cases are well-known, also on the territory of Serbia (tufa of the Sopotnica River, compact laminated rock, despite it, isotope imprint points to travertine). In recently forming sediments, such discrepancy is not a problem, but in the case of fossil accumulations, we should avoid assigning rock as "tufa" or "travertine", especially if names are based only on their structural characteristics.