

## NEW FINDINGS ON FLOW CONTROL IN MARINE STRUCTURES

An experimental study was conducted to control flow behaviors around sequential cylindrical structures such as marine pipelines. The placement of small fins called spoilers and the spacing between them (pitch ratio) were shown to have critical effects on flow separation and vortex formation. These findings are expected to contribute to new design strategies aimed at reducing vortex-induced vibrations and damage in applications such as offshore structures and heat exchangers.

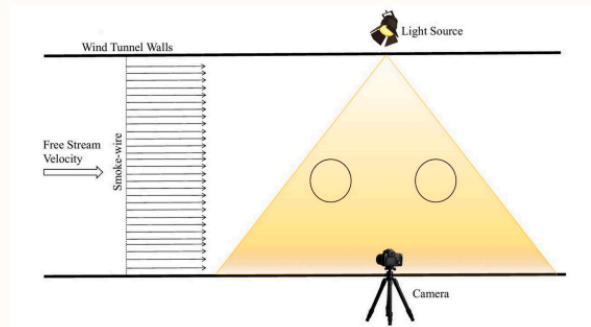


Fig. 2. The schematic view of the smoke-wire flow visualization technique.

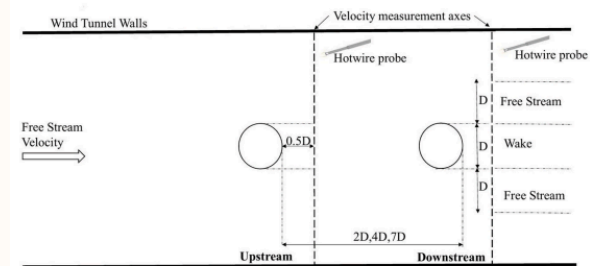


Fig. 3. Schematic representation of the hot-wire anemometry experiment.



İlkentapar, M., Akşit, S., Öner, A. A., & Genç, M. S. (2025). Effect of Different Pitch Ratios on The Flow Around Tandem Circular Cylinders with Spoilers. *Ocean Engineering*, 342, Article 122933. <https://doi.org/10.1016/j.oceaneng.2025.122933>

## THE QUALITY OF NATURAL STONES WAS EVALUATED USING SCIENTIFIC MODELS

Two quantitative models—the Suitability Index (SI) and the Dimensional Stone Field Performance Coefficient (DSFPC)—were applied for rapid and reliable quality assessment of dimensional building stones. Unlike traditional approaches based on a single property, these methods offer a holistic framework that simultaneously evaluates multiple physical and mechanical properties of rocks. The developed integrated modeling approach is regarded as a case study supporting sustainable resource management in the building stone industry.

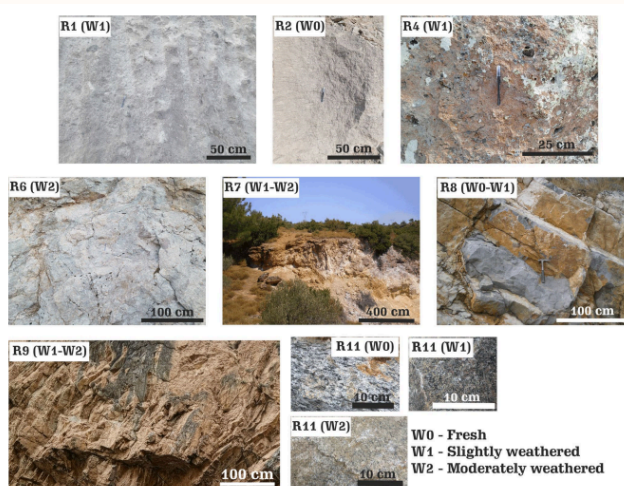


Fig. 2 Some rock exposure with different weathering grades

Koken, E., & Strzałkowski, P. (2025). Integrated Quantitative Modelling for the Dimension Stone Quality Evaluation: Implications for Sustainable Resource Management. *Modeling Earth Systems and Environment*, 11(6), Article 439. <https://doi.org/10.1007/s40808-025-02634-2>



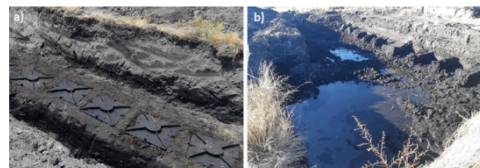
# A NEW ERA IN ECO-FRIENDLY GROUND IMPROVEMENT: A LOW-CARBON SOLUTION

A sustainable solution has been developed to address the geotechnical challenges of peat soils, which are known for their low shear strength and chemical complexities. Hybrid Geopolymer Jet Grout Columns (HGJGCs) are proposed as a low-carbon alternative, achieving 25.14% lower CO<sub>2</sub> emissions compared to traditional cement-based methods. The system has been shown to increase load-bearing capacity by 5.5 times and to be effective even under real field conditions.



Fig. 3 Study site in the KFZ and representative peat stratigraphy

Fig. 4 (a) Sampling procedure in peat deposit, (b) water accumulation in the trench after 24 h



Yalcin, H., Erol, A., Kaya, Z., Çadır, C. C., Uncuoğlu, E., & Akin, M. K. (2025). Sustainable Stabilization of Peat Soil With Hybrid Geopolymer Jet Grout Columns. *International Journal of Geosynthetics and Ground Engineering*, 11(6), Article 59. <https://doi.org/10.1007/s40891-025-00668-1>

# A NEW ERA IN DENTAL TREATMENTS: SMART FILLINGS ELIMINATE WHITE SPOTS

In a laboratory study on enamel white spot lesions that appear after orthodontic treatments, an improved nano-hydroxyapatite (nHAP) material was found to be more effective than conventional fluoride therapies. Micro-CT and QLF analyses demonstrated that the ultrasonically synthesized, yttrium-enriched nHAP restored the mineral content of enamel to the highest level. It was also confirmed that this next-generation remineralization agent does not adversely affect the bond strength of orthodontic brackets.

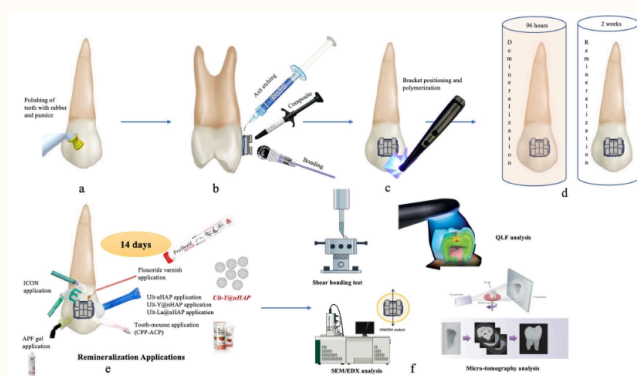


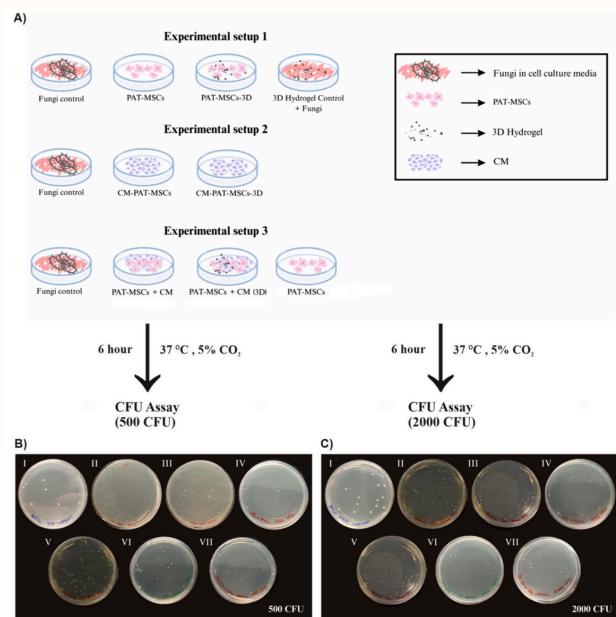
Fig. 1 Schematic diagram illustrating the setup for this study. a polishing of premolar teeth with rubber and pumice. b c bonding and polymerization procedure. d preparation of demineralization and remineralization solutions. e remineralization applications within a 14-day period (ICON, APF Gel, CPP-ACP, Fluoride varnish, Control nHAP, UR-YF<sub>3</sub>-nHAP, UR-LaF<sub>3</sub>-nHAP). f Shear bonding test and, de- and re-mineralized enamel area around brackets submitted to QLF, SEM-EDX, and micro-tomography analysis

Öztürk, T., Mammadov, E., Bulduk Karakaya, H., Yağcı, F., Dayan, S., & Yağcı, A. (2025). Effect of Yttrium/Lanthanum-Doped Ultrasonically Assisted Nano-Hydroxyapatite on Remineralization and Bracket Bond Strength in Artificial Enamel Lesions. *BMC Oral Health*, 25(1), Article 1491. <https://doi.org/10.1186/s12903-025-06823-4>



# A NEW WEAPON AGAINST DRUG-RESISTANT FUNGI DEVELOPED USING CELLS DERIVED FROM PALATAL FAT TISSUE

A new treatment method has been developed against *Candida albicans*, a life-threatening fungus and a major cause of hospital-acquired infections. Factors secreted by mesenchymal stem cells (PAT-MSCs) derived from palatal fat tissue and cultured in a three-dimensional (3D) biomaterial were found to inhibit fungal growth by more than 99%. This 3D culture approach was also observed to enhance the production of LL-37, an antifungal peptide, by the cells.



Bicer, M., Öztürk, E., Sener, F., Hakki, S. S., & Fidan, Ö. (2025). Antifungal Efficacy of 3D-Cultured Palatal Mesenchymal Stem Cells and Their Secreted Factors Against *Candida albicans*. *ACS Infectious Diseases*, 11(10), 2894–2906. <https://doi.org/10.1021/acsinfectdis.5c0065>

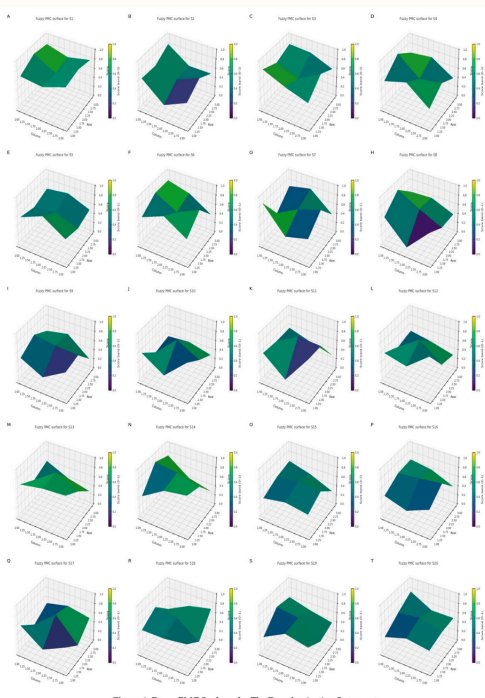


Figure 4. Fuzzy PMC Surfaces for The Decarbonization Statements.

# A NEW METHOD DEVELOPED TO REDUCE THE CARBON FOOTPRINT IN UNIVERSITIES

In the conducted study, a “fuzzy logic-based PMC index” was developed to evaluate policies aimed at reducing carbon emissions in higher education institutions. Based on the campus greenhouse gas inventory prepared in accordance with the ISO 14064-1:2018 standard, the 2023 emissions were calculated as 4,888.63 tons of CO<sub>2</sub>e. This method enabled the prioritization of strategies such as energy efficiency, awareness programs, and virtual meetings. The study provided a scientific roadmap for sustainability policies in universities.

Şener Fidan, F. (2025). Fuzzy Logic-Enhanced PMC Index for Assessing Policies for Decarbonization in Higher Education: Evidence From a Public University. *Sustainability*, 17(19), Article 8966. <https://doi.org/10.3390/su17198966>



# SURFACES OF THE FUTURE ARE COMBINED FOR SUPERIOR PERFORMANCE

To enhance the durability and performance of engineering components, the combined use of surface texturing and coating techniques was investigated. To overcome the limitations of traditional methods, modern techniques such as laser texturing were integrated with coatings to develop more robust surfaces. This synergistic approach has been reported to deliver superior results in various applications, including medical implants and marine engineering.

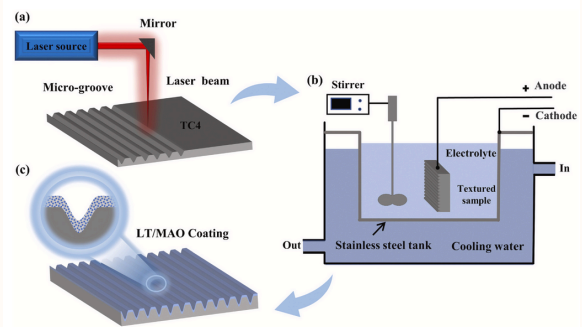
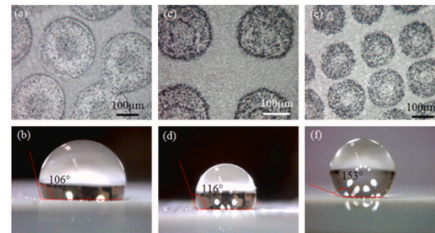


Fig. 27. Preparation process of LT/MAO coating: (a) laser texturing, (b) MAO, and (c) LT/MAO coating [134].



Yuan, Y., Louhichi, B., Heidarshenas, B., Alrasheedi, N. H., Bal, B., & Hussain, G. (2025). Functional Surfaces of the Future: Integrating Texturing and Coatings for Superior Performance. *Materials Today Chemistry*, 48, Article 103017. <https://doi.org/10.1016/j.mtchem.2025.103017>

# TOWARDS THE ZERO-CARBON GOAL WITH SMART WATER NETWORKS

In a study conducted in Funchal, Portugal, a smart system integrating water and energy management achieved the zero-carbon goal. Using artificial intelligence, sensors, and renewable sources (hydro, solar, and wind), this model reduced operating costs by 89.9% and achieved an annual negative CO<sub>2</sub> emission of 160,476 kg. The system simultaneously enhanced environmental sustainability and economic efficiency, presenting a model for the “green cities” of the future.

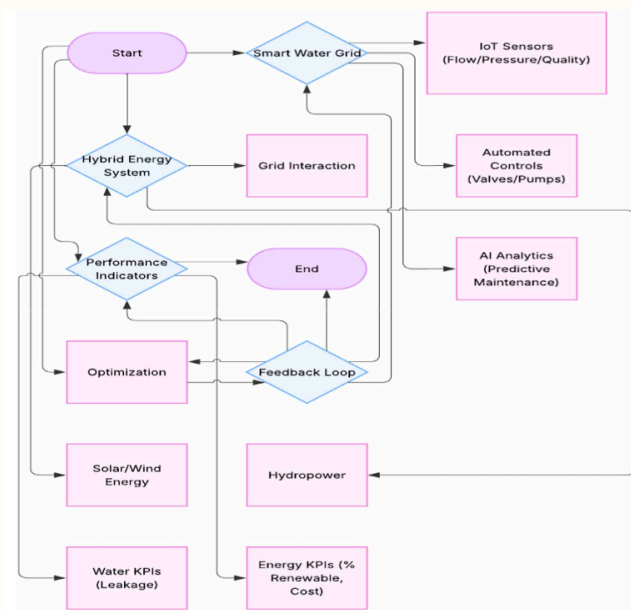


Figure 2 | Summary of the methodology.

Ramos, H. M., Pérez-Sánchez, M., Correia, T., Bekçi, E., Besharat, M., Kuriqi, A., & Coronado-Hernandez, O. E. (2025). Contributions Toward Net-Zero Carbon in the Water Sector: Application to a Case Study. *Aqua Water Infrastructure, Ecosystems and Society*, 74(9), 579–595. <https://doi.org/10.2166/aqua.2025.031>



# PERSONALIZED BIOMATERIAL PRODUCTION MADE EASIER WITH BIOPRINTING TECHNOLOGY

A new method has been developed to adjust the mechanical strength of biocompatible scaffolds used in tissue engineering. The flexibility and stiffness of poly( $\epsilon$ -caprolactone) (PCL)-based scaffolds were successfully controlled by modifying 3D bioprinting parameters such as polymer density, printing speed, and pressure. This approach demonstrated that materials required for applications like wound healing and soft tissue regeneration can be produced in a personalized and reliable manner.

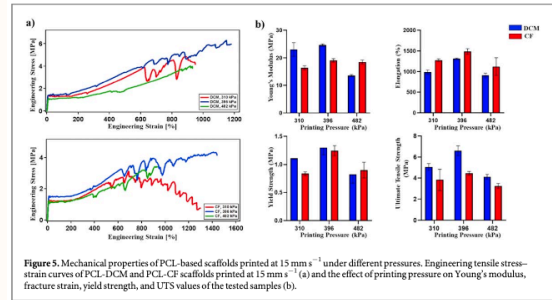


Figure 5. Mechanical properties of PCL-based scaffolds printed at  $15 \text{ mm s}^{-1}$  under different pressures. Engineering tensile stress-strain curves of PCL-DCM and PCL-CF scaffolds printed at  $15 \text{ mm s}^{-1}$  (a) and the effect of printing pressure on Young's modulus, fracture strain, yield strength, and UTS values of the tested samples (b).

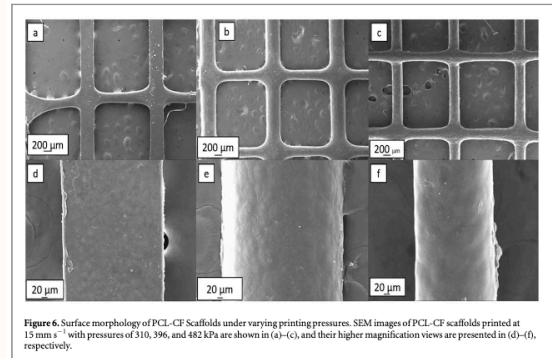


Figure 6. Surface morphology of PCL-CF Scaffolds under varying printing pressures. SEM images of PCL-CF scaffolds printed at  $15 \text{ mm s}^{-1}$  with pressures of 310, 396, and 482 kPa are shown in (a)–(c), and their higher magnification views are presented in (d)–(f), respectively.



Ceylan, S. A., Baltacıoğlu, M. F., Bal, B., Bayram, F. C., & İşoğlu, İ. A. (2025). Tuning Mechanical Performance of PCL Scaffolds: Influence of 3D Bioprinting Parameters, Polymer Concentration, and Solvent Selection. *Materials Research Express*, 12(9), Article 095302. <https://doi.org/10.1088/2053-1591/adf490>

## A NEW ERA IN INFLATION FORECASTING IN TÜRKİYE WITH ARTIFICIAL INTELLIGENCE

The Consumer Price Index (CPI) in Türkiye was predicted using machine learning. In the study conducted with data from 2012–2024, 13 key economic indicators were selected, and Decision Tree, Random Forest, and Support Vector Machine algorithms were compared. Using the “SelectKBest” and “Averaging Voting” methods, the most accurate prediction was achieved with 96.2% accuracy. The findings are expected to enable more stable and reliable inflation forecasting for economic policymaking.

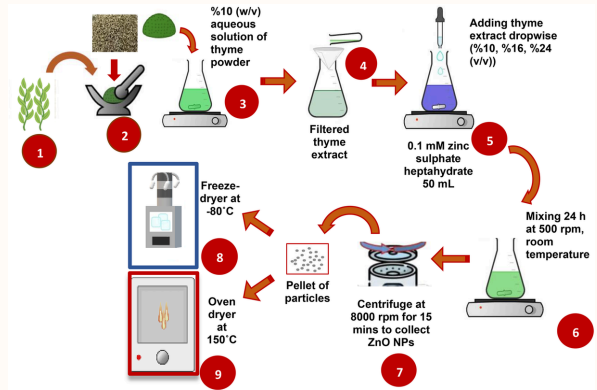
DECISION TREE					
Shifted	R2	MAPE	MAE	MSE	Adjusted R2
1 month	0.876	0.106	70.848	25739.392	0.861
2 months	0.926	0.095	61.947	14721.449	0.917
3 months	0.830	0.101	78.384	31145.914	0.808
4 months	0.330	0.130	102.263	66532.898	0.244
5 months	0.966*	0.055*	32.128*	3503.180*	0.961*
6 months	0.544	0.095	81.437	45944.824	0.484
RANDOM FOREST					
Shifted	R2	MAPE	MAE	MSE	Adjusted R2
1 month	0.953	0.083	50.770*	9768.422	0.947*
2 months	0.934*	0.092	58.391	13119.865	0.926
3 months	0.896	0.084	64.526	19035.692	0.883
4 months	0.918	0.091	53.581	8148.335*	0.907
5 months	0.907	0.095	57.421	9545.724	0.895
6 months	0.883	0.081*	53.853	11824.750	0.867
SVM					
Shifted	R2	MAPE	MAE	MSE	Adjusted R2
1 month	0.970*	0.110	48.895*	6165.007*	0.967*
2 months	0.894	0.147	80.405	21312.991	0.880
3 months	0.942	0.116	59.733	10533.372	0.935
4 months	0.646	0.196	100.292	35189.364	0.600
5 months	0.933	0.101*	49.942	6840.707	0.924
6 months	0.576	0.184	108.060	42661.396	0.521

Nalici, M. E., Soylemez, I., & Unlu, R. (2025). Forecasting the Consumer Price Index in Türkiye Using Machine Learning Models: A Comparative Analysis. *Gazi University Journal of Science*, 38(3), 1359–1372. <https://doi.org/10.35378/gujs.1558496>



# NANO ZINC OXIDE PARTICLES PRODUCED FROM THYME FOUND EFFECTIVE AGAINST BACTERIA

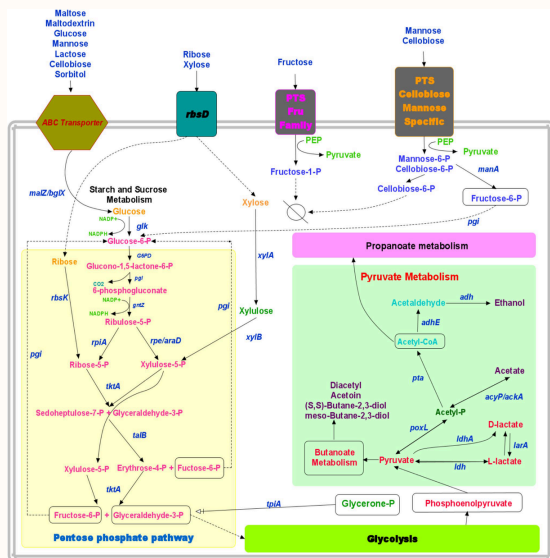
In the study, different concentrations of thyme extract and two drying methods were tested. The best results were obtained with 16% thyme extract and freeze-drying. The produced nanoparticles were found to be 70–75% pure and could be synthesized without the need for high-temperature processing. Antibacterial tests showed effectiveness against both Gram-positive and Gram-negative bacteria. Researchers reported that these nanoparticles could be used in fields such as medical materials and cosmetic products.



Karakaya, H., Kızılateş, B., & Erdem, İ. (2025). Green synthesis and characterization of zinc oxide nanoparticles via thyme for biomedical applications: Effect of plant extract concentration and drying method. *Journal of the Australian Ceramic Society*. <https://doi.org/10.1007/s41779-025-01287-9>

# CANCER-FIGHTING POTENTIAL DISCOVERED IN PROBIOTIC BACTERIUM DERIVED FROM TURNIP JUICE

The *Levilactobacillus brevis* strain (DY55bre) isolated from the traditional Turkish beverage şalgam was examined in detail. Evaluations revealed that this bacterial strain remained stable under intestinal conditions and showed strong adhesion to intestinal cells. Most importantly, the bioactive compounds (cyclic dipeptides) produced by the bacterium exhibited cytotoxic effects, destroying colon cancer cell lines. In addition, the strain was reported to possess antimicrobial, antioxidant, and cholesterol-lowering properties.

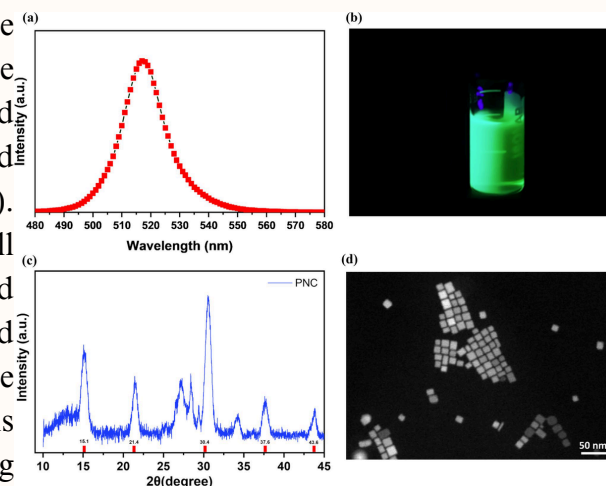


Yetiman, A. E., Horzum, M., Kanbur, E., Çadır, M., Bahar, D., Gürbüz, Ş., Karaman, M. Z., Fidan, Ö., Kaya, M., Yetiman, S., Doğan, M., & Akbulut, M. (2025). Pangenome analysis and genome-guided probiotic evaluation of cyclic dipeptides producing *Levilactobacillus brevis* DY55bre strain from a lactic acid fermented şalgam to assess its metabolic, probiotic potentials, and cytotoxic effects on colorectal cancer cells. *Probiotics and Antimicrobial Proteins*. <https://doi.org/10.1007/s12602-025-10760-7>



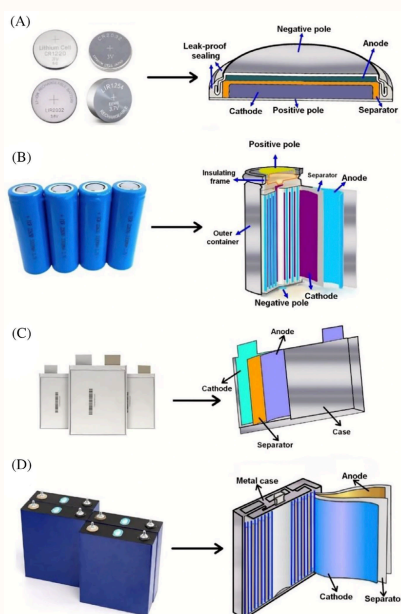
# PERFORMANCE AND DURABILITY OF LIGHT-EMITTING NANOCRYSTALS ENHANCED WITH A NEW COMPOSITE MATERIAL

The environmental durability and light efficiency of nanoscale light-emitting crystals (PNCs) were enhanced using a new low-cost method. The crystals were embedded into a specially designed porous silicon (MPDMS) matrix and combined with plasmonic gold nanoparticles (Au NPs). These composites maintained nearly full efficiency even after immersion in water and exhibited high thermal stability. The gold nanoparticles increased the photoluminescence brightness and lifespan of the nanocrystals. This approach offers a scalable pathway for designing stable materials for next-generation optoelectronic applications.



Ocal, S. K., Tiras, K. S., Önses, M. S., & Mutlugun, E. (2025). Enhanced photoluminescence via plasmonic gold nanoparticles and improved stability of perovskite nanocrystals in macroporous (polydimethylsiloxane) PDMS matrices. *Journal of Materials Science*, 60(42), 20396–20405. <https://doi.org/10.1007/s10853-025-11595-x>

## NEW AND SUSTAINABLE METHODS ARE BEING DEVELOPED FOR THE RECOVERY OF LITHIUM, A KEY BATTERY RAW MATERIAL



With the rapid expansion of electric vehicles (EVs), the demand for lithium is increasing sharply. In a comprehensive review, industrial and innovative methods for recovering battery-grade materials such as high-purity lithium carbonate and lithium hydroxide were evaluated. Unlike traditional processes with environmental and energy drawbacks, new laboratory-scale approaches such as CO<sub>2</sub>-assisted leaching, bioleaching, and membrane separation were found to be more eco-friendly and selective. Considering the growing EV market in countries like Türkiye, the study emphasized the strategic importance of lithium recycling and the development of local supply chains.

Top, S., Kursunoglu, S., & Altiner, M. (2025). A comprehensive review on the extraction and recovery of lithium from primary and secondary sources: Advances toward battery-grade materials. *Canadian Journal of Chemical Engineering*. <https://doi.org/10.1002/cjce.70132>

