

# RECYCLED CONCRETE MEETS ART

*RECIKLIRANI BETON SE SREČA Z UMETNOSTJO*

**Science-art workshop  
at  
TU Wien**

**2024**

*Znanstveno-umetniška delavnica  
na TU Wien*

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Recycled Concrete Meets Art:  
Science-Art Workshop at TU Wien 2024  
Reciklirani beton se sreča z umetnostjo:  
znanstveno-umetniška delavnica na TU Wien 2024

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Avtorji fotografij: Vilma Ducman (strani 3, 4, 6, 9, 11,  
12, 13, 14, 16, 18, 19, 24, 25, 26 in 27)  
Ildiko Merta (strani 5, 15, 20 in 21)  
Sinja Kočica (strani 22 in 23)

Izdala Založba Univerze na Primorskem  
Titov trg 4, 6000 Koper · hippocampus.si  
Koper · 2025

Brezplačna elektronska izdaja  
<https://www.hippocampus.si/ISBN/978-961-293-430-9.pdf>  
<https://doi.org/10.26493/978-961-293-430-9>

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## Kip in urbano povišstvo kot del raziskovalnega projekta na področju znanosti o materialih

Izr. prof. Jiri Kočica, akad. kipar

Velik del civilizacijskih in kulturnih sprememb v zgodovini človeštva se je dogajal predvsem zaradi odkritij in uporabe novih materialov in tehnologij. Cela obdobja imenujemo po teh spremembah (kamena, bakrena, železna doba, atomsko stoletje ...), v sodobnem svetu pa nam je jasno, da materiali dobesedno spreminjajo usodo civilizacij, saj brez določenih materialov nekatere oblike in tudi vsebine sploh ne morejo obstajati- morda zgolj v čisti domišljiji. Možnosti, ki so prišle z novimi odkritji materialov in uvidov v zakonitosti njihovega delovanja, ki so bili prav tako možni šele z dodatnimi odkritji obdelave materialov (npr. ulivanje kovin, izdelava steklenih leč, uporaba kovin in polprevodnikov pri elektriki in računalniških tehnologijah ipd) so do temeljev spreminjali naš svet.



*Predstavitev zasnove in delavnice*  
*Presentation of the workshop concept*

## Sculpture and Urban Furniture as Part of a Research Project in Material Science

Assoc. Prof. Jiri Kočica, Academic Sculptor

A significant portion of the civilizational and cultural changes in human history primarily occurred due to the discovery and application of new materials and technologies. Entire eras are named after these transformations (Stone Age, Bronze Age, Iron Age, Nuclear Age). In the modern world, it is evident that materials profoundly shape the destiny of civilizations. Without specific materials, certain forms and even concepts cannot exist—perhaps only in the realm of imagination.

The possibilities accessed by new material developments and insights into their properties, made possible by additional advances in material processing (e.g., metal casting, glass lens manufacturing, the use of metals and semiconductors in electricity and computing technologies), have fundamentally transformed our world.



*Dodajanje konopljinih vlaken v mešanico recikliranega betona*  
*Hemp fiber admixture in recycled concrete mix*

Materiali so v umetniški praksi z nastopom modernizma in posebej še z nastopom različnih avantgard ter postmodernizma in sodobne umetnosti postali vsaj tako pomemben člen v branju umetniškega dela kot so simbolni vidiki, vpletenost umetnosti v družbo ali odpiranje različnih etičnih in političnih vprašanj. Gre za nekakšno »ikonografijo materialov« in s tem dodatno odpiranje umetnostno zgodovinskih vidikov na področjih, ki so bila sicer tradicionalno vezana na podobo, upodabljanje ali pa na literarne, mitološke, kulturne oziroma tudi politične podlage.

Prav tako se je z modernizmom zaradi sprememb v načinu obravnavanja materialov spremenil celo sam odnos do trajnosti in formalne permanentnosti umetniškega dela. Mnoga dela so postala efemerna, spreminjajoča se, v tranziciji in obenem celo v nekakšni transgresiji vsaj do konvencij, ki so vezane na umetnost. Še posebej pa se je uvedba živih materialov in povsem razgradljivih umetniških del, ki so v nenehnem razvoju, razkroju, rasti ali nenehnih spremembah, pojavila s postmodernistično in sodobno umetnostjo. In kakor so se nova odkritja materialov poznala v umetniških delih različnih zgodovinskih obdobj, tudi danes naletimo na povsem nove materiale v različnih galerijah, sodobnih muzejih, razstavah... Umetniki na podoben način kot so npr. stari Grčiji uporabljali najnovejša znanja o ulivanju bron, danes uporabljajo sekvencioniranje DNK, sestavljajo materijo na nivoju atomov in molekul, ulivajo umetniška dela iz sodobnih polimernih mas, jih tiskajo s 3D tiskalniki itd.

Prav tako je nujno omeniti, da so z nastopom ekoloških težav in različnih učinkov onesnaževanja v umetnost vedno bolj prihajale ideje o vzpostavljanju določenih socialnih dejavnosti (npr. vpliv umetnika Josepha Beuyesa na ustanovitev Stranke zelenih v Nemčiji v 70tih ali vpliv mnogih sodobnih avtorjev, ki se ukvarjajo z razmislekom o materialih ter vsebinskih zasnovah umetnosti, pri katerih gre za odziv na sodobne težave z okoljsko problematiko) ali pa ideje, v katerih se umetniki ukvarjajo neposredno s preišljevanjem možnih pristopov k določenim okoljskim izzivom.



*Varianta kipa Objem (bron, 2011)*  
*Variant of the statue "Hug" (bronze, 2011)*

Projekt, ki ga predstavljamo v tem katalogu, združuje umetniško in oblikovalsko delo z eksperimentalnim delom v področju znanosti o materialih. Pri delu z recikliranim betonom, ki ga raziskujejo na TU Wien, obstajajo že vnaprej določene dimenzije kock, katerih modeli so standardizirani in tako vedno nove poskusne mase ulivajo v te modele, da bi jih kasneje po določenih

In artistic practice, particularly with the modernism and later the avant-garde, postmodernism, and contemporary art, materials have become as crucial in interpreting artwork as symbolic aspects, social engagement, or raising ethical and political questions. This represents a kind of “material iconography”, opening up new art historical perspectives in areas traditionally tied to imagery and representation or literary, mythological, ritual, and political contexts. Modernism also shifted attitudes toward the durability and formal permanence of artworks due to changes in material approaches. Many works have become ephemeral, mutable, transitional, and even transgressive concerning conventional notions of art. Particularly with postmodernism and contemporary art, the introduction of living materials and entirely biodegradable artworks—constantly evolving, decomposing, growing, or changing—has gained prominence.

As material innovations influenced art across historical periods, today’s galleries, modern museums, and exhibitions showcase entirely new materials. Just as ancient Greeks utilized advanced knowledge of bronze casting, contemporary artists employ DNA sequencing, manipulate matter at atomic and molecular levels, cast works in modern polymer composites, and use 3D printing technologies.

Additionally, ecological challenges and pollution issues have increasingly brought concepts of social engagement into art (e.g., Joseph Beuys’ influence in founding the environmentally motivated green party “Die Grünen” in Germany during the 1970s) or approaches directly addressing environmental concerns. Many contemporary artists reflect on materials and the thematic foundations of art in response to pressing ecological issues.

The project presented in this catalog merges artistic and design work with experimental material science. At the TU Wien, research on recycled concrete involves predetermined dimensions, with standardized models used for casting experimental batches. These models enable rigorous testing, such as exposure to aging factors (temperature, humidity, freeze). These standards and shapes facilitate systematic material testing processes.

This pilot project aims to partially integrate tested recycled concrete materials into real-life scenarios, making them part of everyday use. The project aligns with the principles of the New European Bauhaus (NEB) initiative, striving to emphasize sustainability while integrating aesthetics and fostering community involvement at least on a local level.

With a permanent installation on the terrace of the TU Wien Science Centre, the Up!crete project expands its scope with additional data and insights. Artefacts created through collaborations between various laboratories (TU Wien, ZAG, and other Up!crete collaborators) and my sculptural practice will continue to serve as the objects of analysis, measurement, and observation

postopkih tudi preizkušali, podvrgli raznim učinkom staranja (temperatura, vlažnost, zamrzovanje). Gre torej za standarde in oblike, s katerimi najlažje dosežejo vnaprej postavljene procese preizkušanja določenega materiala. Tokratni poizkus ima pilotni značaj in je bil oblikovan tudi z mislijo na to, da se delno že preizkušeni materiali recikliranega betona vpeljejo v neko situacijo, ki je življenjska in katere del bo v vsakodnevni uporabi. Pri tem smo se dogovorili, da se v samem procesu opremo na osnovne parametre Novega evropskega Bauhausa ter skušamo oblikovati sam preizkus kot nekaj, s čimer si poleg že tako preverjene trajnostne naravnosti prizadevamo poudariti estetski vidik in to vpeljati v skupnost vsaj na lokalni mikro-ravni. Tako s permanentno postavitvijo na terasi Znanstvenega centra TU Wlen (Tehnična univerza na Dunaju) projekt "Up!crete" prihaja še do nekaterih dodatnih, razširjenih informacij in novih vsebin. Namreč dela, ki so nastala v povezavi med različnimi laboratoriji (TU Wien, ZAG in še nekaj drugih sodelujočih v projektu »Up!crete«) in so se hkrati oprla na oblikovalske rešitve ter moje kiparsko delo, bodo s postavitvijo v realni prostor uporabe in v prostor atmosferskih vplivov še naprej služila določenim postopkom analiz, meritev in opazovanj.

Hkrati pa bo tako kiparsko delo kot tudi oblikovalske rešitve, narejene iz recikliranega betona, dodatno vpeto ne samo v nadaljnje korake pregledovanj, kakršna so običajna v znanstvenem procesu, ko gre za proučevanje različnih materialov, temveč bo celotna kompozicija odprla še impulz določene skupnostne dinamike, morda tudi vzpodbude tako v kreativnem kot tudi v komunikacijskem smislu.

Urbano pohoštvo, ki smo ga razvili z dr. Vilmo Ducman in prof. dr. Ildiko Merta pa je modularno in omogoča postavitev klopi, mizic, korit za rastline, podstavkov za kipe, ali pa se lahko uporabi tudi za druge namene z malimi korekcijami in dodatki (npr. vodne površine, zelene zidne pregrade, škarpe ipd).

Zaradi vseh teh izhodišč je samo kiparsko delo izpeljano kot stiliziran objem, kakršnega sem v svojem delu večkrat upodobil skozi različne materiale in tudi oblikovne rešitve. Objem kot utrditev vezi med ljudmi ter vzpostavljanja prostora zaupanja simbolno vpeljuje prej opisane modularne enote urbane opreme, ki smo jih umestili v kompozicijo.



when exposed to real-life use and atmospheric conditions.

Simultaneously, both the sculptures and urban furniture made from recycled concrete will not only undergo further scientific scrutiny but will also stimulate community dynamics and encourage creative and communicative interactions.

The urban furniture developed with Dr. Vilma Ducman and Prof. Dr. Ildiko Merta is modular, allowing configurations such as benches, tables, plant containers, sculpture pedestals, or other applications with minor adjustments (e.g., water features, green wall partitions, or retaining walls).

The sculptural work itself, conceived as a stylized embrace—a recurring motif in my work across different materials and forms symbolizes the strengthening of bonds between people and the creation of a space of trust. This embrace motif also integrates the modular urban furniture units into the composition, reinforcing the connection between aesthetic and functional elements.



*Posvet pred ulivanjem рециклиранega betona v model*  
*Consultation before pouring recycled concrete into the mold*



*Udeleženci prvega dela delavnice*  
*Participants of the first part of the workshop*



*Zaključna obdelava*  
*Finishing*

## Izbira materialov kot ključni steber razogljčenja

Dr. Vilma Ducman, prof.dr. Ildiko Merta

Tako v skladu z Evropskim zelenim dogovorom kot z usmeritvami Novega Evropskega Bauhausa (NEB)<sup>1</sup> je preiščena izbira materialov ključna pri doseganju podnebnih ciljev in razogljčenju gradbenega sektorja. NEB je evropska iniciativa, ki želi prispevati k razogljčenju v gradbenem sektorju skozi uporabo trajnostnih materialov ob čemer pa je izrednega pomena tudi estetski vidik in vključevanje različnih deležnikov v procese. Kar nekaj materialov je na voljo, ki znižujejo CO<sub>2</sub> odtis in varujejo naravne vire, saj so bodisi obnovljivi ali temeljijo na sekundarnih surovinah. Uporaba lokalno dostopnih surovin pa še dodatno zmanjšuje vpliv na okolje, povezan s transportom. Uporaba naravnih, bio-obnovljivih materialov, kot sta les, konoplja, slama in ostali vlakneni materiali postaja ponovno vse bolj razširjena. Ti materiali so izjemno okolju prijazni, saj skladiščijo ogljik med rastjo in imajo zato celo negativen ogljični odtis, hkrati pa zahtevajo relativno malo energije za obdelavo.

Les v svojih mnogoterih izpeljankah gradbenega proizvoda, od polnega lesa, križno lepljenih plošč, vezane plošče, lesno vlaknene plošče do izolacije iz lesnih vlaken, je v gradbeništvu široko uporabljen material. Evropa, z obilico gozdov in razvitim lesnim sektorjem, ima tako velik potencial za spodbujanje trajnostne gradnje.

Poleg slame, ki je bila tradicionalno prisotna na naših področjih kot gradbeni material, postaja tudi konoplja vse pogostejša izbira za izolacijske materiale.



*Les kot konstrukcijski in estetski element  
Wood as constructional and aesthetic element*

Konoplja se v obliki konopljinega betona (z apnom vezan konopljin drobir) uporablja tudi kot nosilni element. Vsi naštetni materiali združujejo naravno obnovljivost in visoko funkcionalnost.

Med naravnimi materiali velja izpostaviti tudi proizvode iz nežgane gline kot so ometi ali pa izdelke iz zbite zemljine; v obeh primerih gre za tradicionalno

## Selection of Materials as a Key Pillar of Decarbonization

Dr. Vilma Ducman, Prof. Dr. Ildiko Merta

In line with the European Green Deal and the guidelines of the NEB<sup>1</sup>, a thoughtful selection of materials is essential for achieving climate goals and decarbonizing the construction sector. The European initiative NEB aims to contribute to decarbonization by promoting the use of sustainable materials while also emphasizing aesthetics and stakeholder inclusion. A variety of available materials can reduce CO<sub>2</sub> footprints and preserve natural resources, as they are either renewable or based on secondary raw materials. Using locally available resources further minimizes the environmental impact associated with transportation.



*Zid iz zbite zemljine*  
*Wall made from rammed earth*



*Dekorativni ometi na osnovi gline*  
*Decorative clay based renders*

Using natural, bio-renewable materials such as wood, hemp, straw, and other fibrous materials, is increasingly widespread. These materials can be highly eco-friendly when farmed correctly as they store carbon during growth, resulting in a negative carbon footprint, while requiring relatively little energy for processing.

Wood, in its various forms—solid wood, cross-laminated timber, plywood,

tehniko ki uporablja lokalne surovine kot so zemlja in gramoz. Tovrstni materiali zagotavljajo odlično toplotno maso in nizko utelešeno energijo, čeprav zahtevajo skrbno zaščito pred vlago in zmrzaljo. Dodatno pa se tovrstni materiali lahko še izboljšajo z dodatki apna, celuloze, škroba ...

Med recikriranimi materiali pa vsekakor v gradbenem sektorju zaseda prvo mesto recikliran beton, ki uporablja predelane gradbene odpadke in s tem zmanjšuje potrebo po naravnih agregatih. V kombinaciji z nizkoogljičnimi cementi in s tehnologijami, ki omogočajo zajem CO<sub>2</sub> pri viru nastanka v cementarnah, se tudi področje betona prilagaja zahtevam po razogličanju. Zajet CO<sub>2</sub> pa lahko uporabimo za proizvodnjo karbonatiziranih izdelkov, ki trajno vežejo CO<sub>2</sub>.



*Penjeni alkalijsko aktivirani paneli (žlindra, pepel)  
Foamed alkali activated panels (slag, ash)*

Ob tehnologije reciklaže, ki sodijo v kategorijo t.i. "up-cycling" tehnologij oziroma proizvodnih procesov, ki povečujejo dodano vrednost, prištevamo tudi geopolimerne oziroma alkalijsko aktivirane materiale. Le-ti se proizvajajo pretežno iz odpadnih materialov bogatih s silicijem in aluminijem v amorfnih oblikah, kot so pepeli in žlindre.



*Izolacijski paneli iz micelija  
Insulation panels from mycellium*

Z dodatkom aktivatorjev (denimo vodno steklo) v katerih se ti materiali razatapljajo in med nego ponovno utrdijo, dobimo materiale, ki so alternativa betonu in keramiki.

fibreboards, and wood fibre insulation—is widely used in construction. With its extensive forests and developed wood industry, Europe holds significant potential for promoting sustainable construction.

In addition to straw, traditionally used as a building material in many regions, hemp is also becoming an increasingly popular choice for insulation. Hemp is also used for load-bearing elements in the form of „hempcrete“ where hemp shives are bound with lime. All these materials combine natural renewability with high functionality.



*Ulivanje vzorcev betona iz recikliranih agregatov v laboratoriju TU Wien  
Casting Recycled Aggregate Concrete specimens in the lab of the TU Wien*

Among natural materials, products made from unfired clay, such as plasters and compacted earth products (rammed earth, pressed earth), also stand out. These traditional techniques utilize local resources like soil and gravel. Such materials provide excellent thermal mass and low embodied energy, although they require careful protection against moisture and frost. These materials can be further enhanced with additives such as lime, cellulose and starch etc.

Recycled materials are also gaining prominence, with recycled concrete leading the way in construction. This material repurposes processed con-

Čedalje večji segment (vsaj iz raziskovalnega vidika) pa predstavljajo neke vrste eksperimentalni materiali, kjer se uporabna in komercialna vrednost šele raziskuje. Med te sodijo denimo uporaba micelija (vlakn gliv) za izdelavo trdnih, vodoodpornih in ognjevarnih materialov. Ali pa materiali, ki vsebujejo bakterije, ki tvorijo kalcijev karbonat iz CO<sub>2</sub> iz zraka in na ta način tvorijo gradbeni proizvod.

Mikroorganizmi so lahko tudi sestavni del t.i. bioreceptivnega betona, ki je zasnovan tako, da omogoči oziroma lajša rast organizmov (npr. mahov in alg) s čimer aktivno zmanjšuje CO<sub>2</sub> iz atmosfere.

To je le nekaj vidnejših primerov nizkoogljičnih gradbenih materialov; dodatno sinergijo pa lahko dosežemo s kombinacijo teh materialov, kar ob pravilnem načrtovanju omogoča trajnostno gradnjo z minimalnimi kompromisi glede lastnosti objektov.



*Konopljin beton  
Hamp-crete*



struction waste, reducing the need for natural aggregates. Combined with low-carbon cements and technologies enabling CO<sub>2</sub> capture at cement plants, concrete is adapting to decarbonization demands. Captured CO<sub>2</sub> can even be utilized to produce carbonated products that permanently bind CO<sub>2</sub>. Recycling technologies in the category of “upcycling,” which increase added value, include geopolymer or alkali-activated materials. These are predominantly produced from waste materials rich in amorphous silicon- and aluminium-oxides such as ashes and slags. By adding activators such as „water glass“, these materials partially dissolved and then harden during curing, providing viable alternatives to concrete and ceramics.

A growing segment, particularly from a research perspective, includes experimental materials with still-developing practical and commercial applications. Examples include the use of mycelium (fungal fibers) to produce solid, waterproof, and fire-resistant materials, or materials containing bacteria that form calcium carbonate from atmospheric CO<sub>2</sub>, thus creating a construction product.

Microorganisms can also be integral to so-called „bio-receptive concrete“, designed to facilitate or support the growth of organisms like mosses and algae, actively capturing CO<sub>2</sub> from the atmosphere.

These are just a few notable examples of low-carbon construction materials. Additional synergies can be achieved by combining these materials, allowing for sustainable construction with minimal compromises in building performance when carefully planned.

Prof. Dr. Ildiko Merta

Gradbena industrija je glede porabe virov ena najbolj intenzivnih panog na svetu. V Evropski uniji je približno 50 % vseh izkopanih surovin mogoče pripisati gradbenemu sektorju. Od teh je 90 % neobnovljivih mineralnih surovin, kot so gramoz, pesek in kamen. Poleg tega je približno 37 % odpadkov, ki nastanejo v EU, povezanih z gradbenim sektorjem – največji delež (po količini in masi) med temi odpadki pa predstavlja beton. Beton je najpogosteje uporabljeni gradbeni material na svetu, vsako leto se uporabi približno 42.000 milijonov ton betona (36 milijonov ton v Avstriji).

Danes se večina gradbenih odpadkov ponovno uporablja predvsem kot polnilo v cestogradnji ali kot drenaža. Vendar pa ponovno uporabo gradbenih odpadkov v nižjih kakovostnih aplikacijah označujemo kot načelo »down-cycling«-a (zmanjšanje kakovosti).



*Gradbeni odpadki  
Construction and demolition waste*

V EU je ta praksa že precej uveljavljena, saj je le zanemarljiv odstotek (manj kot približno 10 %) gradbenih ruševin predelanih v visokokakovostne aplikacije kot je denimo reciklirani beton.

Vendar pa je za zmanjšanje porabe primarnih surovin in znatno povečanje reciklacijskega potenciala odpadnega betona oziroma gradbenih ruševin ključno močno spodbujanje načel »up-cycling«-a (povečanja kakovosti). Ponovna uporaba odpadnih materialov v podobni ali celo višji kakovosti je navedena kot eden ključnih ciljev in vzvodov krožnega gradbeništva. V tem smislu ponovna uporaba gradbenih ruševin v obliki recikliranega betona predstavlja odlično priložnost za povečanje ohranjanja virov v gradbeni industriji in vrnitev znatnega deleža mineralnih odpadkov v gradbeni sektor, s čimer se zapirajo materialni tokovi. Če so transportne razdalje med gradbiščem in mestom rušenja relativno kratke, je reciklirani beton lahko ekološko in ekonomsko smiselna alternativa običajnemu betonu.

## Recycled concrete – Up!crete<sup>2</sup> project

Prof. Dr. Ildiko Merta

The construction industry is one of the most resource-intensive sectors in the world. In the European Union, around 50% of all extracted raw materials can be attributed to the construction sector. Of these, 90% are non-renewable mineral raw materials such as gravel, sand and stone. In addition, around 37% of the waste generated in the EU can be attributed to the construction sector - the highest proportion (in terms of volume and mass) of which is concrete. Concrete is the most widely used building material in the world: around 42,000 million tons of concrete are used every year (36 million tons in Austria).

Nowadays, the majority of demolished concrete is reused, primarily as a



*Različne frakcije recikliranih agregatov*  
*Different fractions of recycled aggregates*

filling material in road construction or drainage. However, reusing demolished waste materials in lower grade applications is a downcycling principle. In the EU, this practice of downcycling demolished concrete is already widely established, with only a small fraction of less than approx. 10% of demolished concrete being processed and used for higher grade applications such as new recycled concrete.

However, in order to reduce the consumption of primary raw materials and significantly increase the recycling potential of concrete, it is essential to strongly promote upcycling principles in the utilization of demolished concrete.

The reuse of recycled materials in a similar or even higher quality is stated to be a key objective and leverage in circular economy construction. In this respect, the reuse of demolished concrete in the form of recycled concrete represents an excellent opportunity to significantly increase the conservation of resources in the construction industry and to return a considerable proportion of mineral waste to the construction sector, thus closing material cycles.

»Up-cycling« betona iz gradbenih ruševin in njegovo ponovno vključevanje v materialni tok v obliki recikliranega betona s primerljivimi lastnostmi kot primarni beton se trenutno še sooča z velikimi tehničnimi, znanstvenimi, gospodarskimi in zakonodajnimi ovirami. Reciklirani beton ima precej višjo poroznost in absorpcijo vode ter posledično nižjo trdnost in trajnost v primerjavi s primarnim betonom. Posledično so evropski in nacionalni standardi za reciklirani beton zelo konzervativni in dovoljujejo le nizke stopnje zamenjave naravnih agregatov z recikliranimi (do 50 % v Avstriji). Cilj projekta UP!crete (<https://up-crete.project.tuwien.ac.at/en/>) je močno spodbujanje »up-cycling« betona v Avstriji, uvajati betonske odpadke v visokokakovostne aplikacije ter razvijati nove pristope za njegov »up-cycling«. UP!crete je največji tekoči raziskovalni projekt o recikliranju betona v Avstriji, kamor je vključenih 24 partnerjev tako iz področja znanosti kakor tudi industrije, kar zajema strokovno znanje celotne vrednostne verige in omogoča izvedbo najboljšežnejših sistemsko-parametričnih testov v Avstriji; tudi skozi razmišljanje preko normativnih meja.



*Konsistenca recikliranega betona  
Consistency of mixture of recycled concrete*

Razvoj je podprt z optimizacijo ekološkega vidika in preverjanjem možnosti prehoda na industrijski nivo. Prepletanje kompetenc vseh partnerjev v konzorciju bo pomembno prispevalo k tem ciljem in posledično k uspehu projekta. V okviru projekta UP!crete tako podrobno raziskujemo zmogljivosti recikliranega betona oziroma izboljšujemo lastnosti recikliranih agregatov, da bi omogočili večje deleže zamenjave naravnih agregatov z recikliranimi. Poudarek je na zmanjšanju poroznosti in absorpcije vode recikliranih agregatov z naprednimi metodami, kot sta karbonatizacija in zgostitev agregata. Trenutno poteka razvoj, testiranje in optimizacija novih visokozmogljivih recikliranih betonov za notranjo in zunanjo uporabo. Tudi delavnica »Recycled concrete meets art«, predstavljena v pričujočem katalogu, naslavlja cilje projekta »Up!crete« in jih dopolnjuje z načeli, ki jih

Provided that the transport distances between the demolition site and the construction site are relatively short, recycled concrete can be an ecologically and economically viable alternative to conventional concrete.

Upcycling demolished concrete and reintroducing it to the material cycle in the form of recycled concrete, with comparable properties to primary concrete, is currently facing massive technical, scientific, economic and regulatory obstacles. Recycled concrete has a higher porosity and water absorption, and therefore lower strength and durability than primary concrete. Consequently, the European and national standards for recycled concrete are very conservative allowing only low replacement rates of natural aggregates with recycled aggregates (up to 50% in Austria).

The goal of the UP!crete project (<https://up-crete.project.tuwien.ac.at/en/>) is to significantly promote concrete upcycling in Austria, introducing concrete waste into high-quality applications and developing new approaches for its upcycling. UP!crete is the largest ongoing research project concerning concrete recycling in Austria with a collaborative setting of 24 partners from science and industry. This concentrated expertise of the entire value chain

makes it possible to carry out the most extensive system-parametric tests in Austria and to think beyond normative boundaries. The development is accompanied and optimized with ecological system considerations and industrial scalability. The competence interaction of all partners in the consortium will make a significant contribution to success.



*Ulivanje recikliranega betona v modele*  
*Pouring of recycled concrete into the molds*

In the frame of the UP!crete project, the performance of recycled concrete is researched in detail and the properties of recycled aggregates are significantly improved in order to enable a higher replacement ratios of natural aggregates. The focus is on lowering the porosity and water absorption of the recycled aggregates by advanced methods like carbonation and densification. Novel high performance recycled concretes for various indoor and outdoor applications under development are being tested and optimized at the moment.

spodbuja Novi evropski Bauhaus pod sloganom “lepo – trajnostno – vključujoče”. Ta pobuda spodbuja inovacije v trajnostnih materialih, vključevanje lokalnih skupnosti in estetsko nadgradnjo procesov, s čimer krepi povezavo med funkcionalnostjo, trajnostjo in umetniškim izražanjem. Ravno to pa smo skušali doseči s to postavitvijo.



*Odprtje permanentne postavitve urbanega pohištva in kiparskega dela*  
*Opening of the permanent instalation of urban furniture and sculpture*



*Avtorji izdelkov iz recikliranega betona*  
*Authors of artefacts made from recycled concrete*



*Svečano odprtje postavitve*  
*Official opening of the instalation*



*Pogled na postavitev*  
*Installation view*

2- Up!crete: <https://up-crete.project.tuwien.ac.at/>



addresses the objectives of the “Up!crete” project while complementing them with the principles promoted by the New European Bauhaus under the slogan “beautiful – sustainable – together”. This initiative fosters innovation in sustainable materials, the involvement of local communities, and the aesthetic enhancement of processes, thereby strengthening the connection between functionality, sustainability, and artistic expression. This very synergy is what we aimed to achieve with this installation.

UP!crete is funded by the FFG basic program Collective Research with funds from the BMK (The Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology) and co-financed by the project partners.



*Materiali, ki so uporabljeni za izdelavo recikliranega betona v steklenih posodah  
Materials used for producing recycled concrete in glass containers*

2- Up!crete: <https://up-crete.project.tuwien.ac.at/>



*Skica za kip*  
*Sketch for the sculpture*



*Detajl*  
*Detail*

