

## Supplementary Material

**Table S1.** Strategies used to refine and attain final documents from the Scopus database.

Search string	Query	Number of documents
Selected keywords	TITLE-ABS-KEY ( ( micp ) OR ( microbial AND induced AND carbonate AND precipitation ) OR ( microbial AND induced AND calcite AND precipitation ) OR ( microbially AND induced AND calcium AND carbonate AND precipitation ) AND ( hydrology ) OR ( hydraulic AND conductivities ) OR ( fluid AND injection AND experiments ) OR ( infiltration ) OR ( cementation AND solution ) OR ( injection AND rates ) OR ( fracture AND development ) OR ( matrix AND flow ) OR ( permeability ) OR ( hydraulic AND properties ) OR ( porosity ) OR ( flow AND processes ) OR ( fracture AND patterns ) OR ( pore AND volume AND ratio ) OR ( injection AND rate ) OR ( soil-water AND repellency ) OR ( aquifer AND storage ) OR ( flow AND rate ) OR ( syringe AND pump ) OR ( geo-environmental AND engineering ) OR ( groundwater AND hydraulics ) OR ( porous AND media ) OR ( water AND resources ) OR ( contaminant AND hydrology ) OR ( urea AND hydrolysis ) OR ( pore AND network ) OR ( crystal AND growth ) OR ( chemical AND precipitation ) OR ( adsorption ) OR ( ion AND exchange ) OR ( toxic AND metals ) OR ( groundwater AND hydraulics ) OR ( breakdown AND pressure ) OR ( viscous AND fluid ) OR ( infiltration AND dominance ) )	2522
Limit document type to "article"	TITLE-ABS-KEY ( ( micp ) OR ( microbial AND induced AND carbonate AND precipitation ) OR ( microbial AND induced AND calcite AND precipitation ) OR ( microbially AND induced AND calcium AND carbonate AND precipitation ) AND ( hydrology ) OR ( hydraulic AND conductivities ) OR ( fluid AND injection AND experiments ) OR ( infiltration ) OR ( cementation AND solution ) OR ( injection AND rates ) OR ( fracture AND development ) OR ( matrix AND flow ) OR ( permeability ) OR ( hydraulic AND properties ) OR ( porosity ) OR ( flow AND processes ) OR ( fracture AND patterns ) OR ( pore AND volume AND ratio ) OR ( injection AND rate ) OR ( soil-water AND repellency ) OR ( aquifer AND storage ) OR ( flow AND rate ) OR ( syringe AND pump ) OR ( geo-environmental AND engineering ) OR ( groundwater AND hydraulics ) OR ( porous AND media ) OR ( water AND resources ) OR ( contaminant AND hydrology ) OR ( urea AND hydrolysis ) OR ( pore AND network ) OR ( crystal AND growth ) OR ( chemical AND precipitation ) OR ( adsorption ) OR ( ion AND exchange ) OR ( toxic AND metals ) OR ( groundwater AND hydraulics ) OR ( breakdown AND pressure ) OR ( viscous AND fluid ) OR (	1827

		infiltration AND dominance ) ) AND ( EXCLUDE ( DOCTYPE , "er" ) OR EXCLUDE ( DOCTYPE , "cr" ) OR EXCLUDE ( DOCTYPE , "ch" ) OR EXCLUDE ( DOCTYPE , "re" ) OR EXCLUDE ( DOCTYPE , "cp" ) OR EXCLUDE ( DOCTYPE , "no" ) )	
Limit source type to "journal"	to	TITLE-ABS-KEY ( ( micp ) OR ( microbial AND induced AND carbonate AND precipitation ) OR ( microbial AND induced AND calcite AND precipitation ) OR ( microbially AND induced AND calcium AND carbonate AND precipitation ) AND ( hydrology ) OR ( hydraulic AND conductivities ) OR ( fluid AND injection AND experiments ) OR ( infiltration ) OR ( cementation AND solution ) OR ( injection AND rates ) OR ( fracture AND development ) OR ( matrix AND flow ) OR ( permeability ) OR ( hydraulic AND properties ) OR ( porosity ) OR ( flow AND processes ) OR ( fracture AND patterns ) OR ( pore AND volume AND ratio ) OR ( injection AND rate ) OR ( soil-water AND repellency ) OR ( aquifer AND storage ) OR ( flow AND rate ) OR ( syringe AND pump ) OR ( geo-environmental AND engineering ) OR ( groundwater AND hydraulics ) OR ( porous AND media ) OR ( water AND resources ) OR ( contaminant AND hydrology ) OR ( urea AND hydrolysis ) OR ( pore AND network ) OR ( crystal AND growth ) OR ( chemical AND precipitation ) OR ( adsorption ) OR ( ion AND exchange ) OR ( toxic AND metals ) OR ( groundwater AND hydraulics ) OR ( breakdown AND pressure ) OR ( viscous AND fluid ) OR ( infiltration AND dominance ) ) AND ( EXCLUDE ( DOCTYPE , "er" ) OR EXCLUDE ( DOCTYPE , "cr" ) OR EXCLUDE ( DOCTYPE , "ch" ) OR EXCLUDE ( DOCTYPE , "re" ) OR EXCLUDE ( DOCTYPE , "cp" ) OR EXCLUDE ( DOCTYPE , "no" ) ) AND ( EXCLUDE ( SRCTYPE , "d" ) OR EXCLUDE ( SRCTYPE , "k" ) OR EXCLUDE ( SRCTYPE , "p" ) )	1819
Limit language to "English"	to	TITLE-ABS-KEY ( ( micp ) OR ( microbial AND induced AND carbonate AND precipitation ) OR ( microbial AND induced AND calcite AND precipitation ) OR ( microbially AND induced AND calcium AND carbonate AND precipitation ) AND ( hydrology ) OR ( hydraulic AND conductivities ) OR ( fluid AND injection AND experiments ) OR ( infiltration ) OR ( cementation AND solution ) OR ( injection AND rates ) OR ( fracture AND development ) OR ( matrix AND flow ) OR ( permeability ) OR ( hydraulic AND properties ) OR ( porosity ) OR ( flow AND processes ) OR ( fracture AND patterns ) OR ( pore AND volume AND ratio ) OR ( injection AND rate ) OR ( soil-water AND repellency ) OR ( aquifer AND storage ) OR ( flow AND rate ) OR ( syringe AND pump ) OR ( geo-environmental AND engineering ) OR ( groundwater AND hydraulics ) OR ( porous AND media ) OR ( water AND resources ) OR ( contaminant AND hydrology ) OR ( urea	1675

	<p>AND hydrolysis ) OR ( pore AND network ) OR ( crystal AND growth ) OR ( chemical AND precipitation ) OR ( adsorption ) OR ( ion AND exchange ) OR ( toxic AND metals ) OR ( groundwater AND hydraulics ) OR ( breakdown AND pressure ) OR ( viscous AND fluid ) OR ( infiltration AND dominance ) ) AND ( EXCLUDE ( DOCTYPE , "er" ) OR EXCLUDE ( DOCTYPE , "cr" ) OR EXCLUDE ( DOCTYPE , "ch" ) OR EXCLUDE ( DOCTYPE , "re" ) OR EXCLUDE ( DOCTYPE , "cp" ) OR EXCLUDE ( DOCTYPE , "no" ) ) AND ( EXCLUDE ( SRCTYPE , "d" ) OR EXCLUDE ( SRCTYPE , "k" ) OR EXCLUDE ( SRCTYPE , "p" ) ) AND ( EXCLUDE ( LANGUAGE , "French" ) OR EXCLUDE ( LANGUAGE , "Hungarian" ) OR EXCLUDE ( LANGUAGE , "Japanese" ) OR EXCLUDE ( LANGUAGE , "Korean" ) OR EXCLUDE ( LANGUAGE , "Ukrainian" ) OR EXCLUDE ( LANGUAGE , "Polish" ) OR EXCLUDE ( LANGUAGE , "Chinese" ) )</p>	
<p>Boolean was used to eliminate review papers "AND NOT (TITLE review)"</p>	<p>TITLE-ABS-KEY ( ( micp ) OR ( microbial AND induced AND carbonate AND precipitation ) OR ( microbial AND induced AND calcite AND precipitation ) OR ( microbially AND induced AND calcium AND carbonate AND precipitation ) AND ( hydrology ) OR ( hydraulic AND conductivities ) OR ( fluid AND injection AND experiments ) OR ( infiltration ) OR ( cementation AND solution ) OR ( injection AND rates ) OR ( fracture AND development ) OR ( matrix AND flow ) OR ( permeability ) OR ( hydraulic AND properties ) OR ( porosity ) OR ( flow AND processes ) OR ( fracture AND patterns ) OR ( pore AND volume AND ratio ) OR ( injection AND rate ) OR ( soil-water AND repellency ) OR ( aquifer AND storage ) OR ( flow AND rate ) OR ( syringe AND pump ) OR ( geo-environmental AND engineering ) OR ( groundwater AND hydraulics ) OR ( porous AND media ) OR ( water AND resources ) OR ( contaminant AND hydrology ) OR ( urea AND hydrolysis ) OR ( pore AND network ) OR ( crystal AND growth ) OR ( chemical AND precipitation ) OR ( adsorption ) OR ( ion AND exchange ) OR ( toxic AND metals ) OR ( groundwater AND hydraulics ) OR ( breakdown AND pressure ) OR ( viscous AND fluid ) OR ( infiltration AND dominance ) ) AND NOT ( title AND review ) AND ( EXCLUDE ( SRCTYPE , "d" ) OR EXCLUDE ( SRCTYPE , "k" ) OR EXCLUDE ( SRCTYPE , "p" ) ) AND ( EXCLUDE ( DOCTYPE , "er" ) OR EXCLUDE ( DOCTYPE , "cr" ) OR EXCLUDE ( DOCTYPE , "ch" ) OR EXCLUDE ( DOCTYPE , "re" ) OR EXCLUDE ( DOCTYPE , "cp" ) OR EXCLUDE ( DOCTYPE , "no" ) ) AND ( EXCLUDE ( LANGUAGE , "French" ) OR EXCLUDE ( LANGUAGE , "Hungarian" ) OR EXCLUDE ( LANGUAGE , "Japanese" ) OR EXCLUDE ( LANGUAGE , "Korean" ) OR EXCLUDE ( LANGUAGE , "Ukrainian" ) OR EXCLUDE ( LANGUAGE , "Polish" ) OR EXCLUDE ( LANGUAGE ,</p>	1221

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		"Chinese" ) )
Remove papers based on EID	unwanted	TITLE-ABS-KEY ( ( micp ) OR ( microbial AND induced AND carbonate AND precipitation ) OR ( microbial AND induced AND calcite AND precipitation ) OR ( microbially AND induced AND calcium AND carbonate AND precipitation ) AND ( hydrology ) OR ( hydraulic AND conductivities ) OR ( fluid AND injection AND experiments ) OR ( infiltration ) OR ( cementation AND solution ) OR ( injection AND rates ) OR ( fracture AND development ) OR ( matrix AND flow ) OR ( permeability ) OR ( hydraulic AND properties ) OR ( porosity ) OR ( flow AND processes ) OR ( fracture AND patterns ) OR ( pore AND volume AND ratio ) OR ( injection AND rate ) OR ( soil-water AND repellency ) OR ( aquifer AND storage ) OR ( flow AND rate ) OR ( syringe AND pump ) OR ( geo-environmental AND engineering ) OR ( groundwater AND hydraulics ) OR ( porous AND media ) OR ( water AND resources ) OR ( contaminant AND hydrology ) OR ( urea AND hydrolysis ) OR ( pore AND network ) OR ( crystal AND growth ) OR ( chemical AND precipitation ) OR ( adsorption ) OR ( ion AND exchange ) OR ( toxic AND metals ) OR ( groundwater AND hydraulics ) OR ( breakdown AND pressure ) OR ( viscous AND fluid ) OR ( infiltration AND dominance ) ) AND NOT ( title AND review ) AND NOT EID ( 2-s2.0-1842719781 OR 2-s2.0-0036800835 OR 2-s2.0-33748045836 OR 2-s2.0-0034793915 OR 2-s2.0-41049109163 OR 2-s2.0-84864310755 OR 2-s2.0-0030426444 OR 2-s2.0-0036827271 OR 2-s2.0-33947313011 OR 2-s2.0-84855821379 OR 2-s2.0-77649178057 OR 2-s2.0-33749099519 OR 2-s2.0-0342632433 OR 2-s2.0-84862266120 OR 2-s2.0-25144456050 OR 2-s2.0-0034932442 OR 2-s2.0-84873324461 OR 2-s2.0-0000112293 OR 2-s2.0-15744380435 OR 2-s2.0-32844474159 OR 2-s2.0-0035973222 OR 2-s2.0-33845709797 OR 2-s2.0-79955791180 OR 2-s2.0-33745130782 OR 2-s2.0-1542290606 OR 2-s2.0-53349107368 OR 2-s2.0-84863305456 OR 2-s2.0-33644866869 OR 2-s2.0-14344273767 OR 2-s2.0-84858704724 OR 2-s2.0-0033166304 OR 2-s2.0-84858986512 OR 2-s2.0-5044226966 OR 2-s2.0-0033387133 OR 2-s2.0-84873317955 OR 2-s2.0-64549116273 OR 2-s2.0-58149474174 OR 2-s2.0-80054948468 OR 2-s2.0-79955836066 OR 2-s2.0-79955545914 OR 2-s2.0-84857910088 OR 2-s2.0-4243148638 OR 2-s2.0-0030752246 OR 2-s2.0-70350154696 OR 2-s2.0-0028986254 OR 2-s2.0-77954009948 OR 2-s2.0-21344456796 OR 2-s2.0-84859620933 OR 2-s2.0-59249096785 ) AND ( EXCLUDE ( SRCTYPE , "d" ) OR EXCLUDE ( SRCTYPE , "k" ) OR EXCLUDE ( SRCTYPE , "p" ) ) AND ( EXCLUDE ( DOCTYPE , "er" ) OR EXCLUDE ( DOCTYPE , "cr" ) OR EXCLUDE ( DOCTYPE , "ch" ) OR EXCLUDE ( DOCTYPE , "re" ) OR EXCLUDE ( DOCTYPE , "cp" ) OR EXCLUDE ( DOCTYPE , "no" ) ) AND ( EXCLUDE ( LANGUAGE , "French" ) OR EXCLUDE ( LANGUAGE ,

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2-s2.0-59249096785	"Hungarian" ) OR EXCLUDE ( LANGUAGE , "Japanese" ) OR EXCLUDE ( LANGUAGE , "Korean" ) OR EXCLUDE ( LANGUAGE , "Ukrainian" ) OR EXCLUDE ( LANGUAGE , "Polish" ) OR EXCLUDE ( LANGUAGE , "Chinese" ) )	
Removed further unwanted papers using AND NOT TITLE-ABS-KEY ( nuclear AND magnetic AND resonance OR mercury AND injection AND capillary AND pressure )	TITLE-ABS-KEY ( ( micp ) OR ( microbial AND induced AND carbonate AND precipitation ) OR ( microbial AND induced AND calcite AND precipitation ) OR ( microbially AND induced AND calcium AND carbonate AND precipitation ) AND ( hydrology ) OR ( hydraulic AND conductivities ) OR ( fluid AND injection AND experiments ) OR ( infiltration ) OR ( cementation AND solution ) OR ( injection AND rates ) OR ( fracture AND development ) OR ( matrix AND flow ) OR ( permeability ) OR ( hydraulic AND properties ) OR ( porosity ) OR ( flow AND processes ) OR ( fracture AND patterns ) OR ( pore AND volume AND ratio ) OR ( injection AND rate ) OR ( soil-water AND repellency ) OR ( aquifer AND storage ) OR ( flow AND rate ) OR ( syringe AND pump ) OR ( geo-environmental AND engineering ) OR ( groundwater AND hydraulics ) OR ( porous AND media ) OR ( water AND resources ) OR ( contaminant AND hydrology ) OR ( urea AND hydrolysis ) OR ( pore AND network ) OR ( crystal AND growth ) OR ( chemical AND precipitation ) OR ( adsorption ) OR ( ion AND exchange ) OR ( toxic AND metals ) OR ( groundwater AND hydraulics ) OR ( breakdown AND pressure ) OR ( viscous AND fluid ) OR ( infiltration AND dominance ) ) AND NOT ( title AND review ) AND NOT EID ( 2-s2.0-1842719781 OR 2-s2.0-0036800835 OR 2-s2.0-33748045836 OR 2-s2.0-0034793915 OR 2-s2.0-41049109163 OR 2-s2.0-84864310755 OR 2-s2.0-0030426444 OR 2-s2.0-0036827271 OR 2-s2.0-33947313011 OR 2-s2.0-84855821379 OR 2-s2.0-77649178057 OR 2-s2.0-33749099519 OR 2-s2.0-0342632433 OR 2-s2.0-84862266120 OR 2-s2.0-25144456050 OR 2-s2.0-0034932442 OR 2-s2.0-84873324461 OR 2-s2.0-0000112293 OR 2-s2.0-15744380435 OR 2-s2.0-32844474159 OR 2-s2.0-0035973222 OR 2-s2.0-33845709797 OR 2-s2.0-79955791180 OR 2-s2.0-33745130782 OR 2-s2.0-1542290606 OR 2-s2.0-53349107368 OR 2-s2.0-84863305456 OR 2-s2.0-33644866869 OR 2-s2.0-14344273767 OR 2-s2.0-84858704724 OR 2-s2.0-0033166304 OR 2-s2.0-84858986512 OR 2-s2.0-5044226966 OR 2-s2.0-0033387133 OR 2-s2.0-84873317955 OR 2-s2.0-64549116273 OR 2-s2.0-58149474174 OR 2-s2.0-80054948468 OR 2-s2.0-79955836066 OR 2-s2.0-79955545914 OR 2-s2.0-84857910088 OR 2-s2.0-4243148638 OR 2-s2.0-0030752246 OR 2-s2.0-70350154696 OR 2-s2.0-0028986254 OR 2-s2.0-77954009948 OR 2-s2.0-21344456796 OR 2-s2.0-84859620933 OR 2-s2.0-59249096785 ) AND NOT TITLE-ABS-KEY ( nuclear AND magnetic AND resonance OR mercury AND injection AND capillary AND pressure ) AND ( EXCLUDE ( SRCTYPE , "d" ) OR EXCLUDE ( SRCTYPE , "k" ) OR EXCLUDE ( SRCTYPE ,	1098

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"p" ) ) AND ( EXCLUDE ( DOCTYPE , "er" ) OR EXCLUDE ( DOCTYPE , "cr" ) OR EXCLUDE ( DOCTYPE , "ch" ) OR EXCLUDE ( DOCTYPE , "re" ) OR EXCLUDE ( DOCTYPE , "cp" ) OR EXCLUDE ( DOCTYPE , "no" ) ) AND ( EXCLUDE ( LANGUAGE , "French" ) OR EXCLUDE ( LANGUAGE , "Hungarian" ) OR EXCLUDE ( LANGUAGE , "Japanese" ) OR EXCLUDE ( LANGUAGE , "Korean" ) OR EXCLUDE ( LANGUAGE , "Ukrainian" ) OR EXCLUDE ( LANGUAGE , "Polish" ) OR EXCLUDE ( LANGUAGE , "Chinese" ) ) )

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**Table S2.** Important information about 10 prolific authors available in Scopus database.

Authors	Affiliation	Scopus	ORCID
Chu, Jian	Nanyang Technological University	25026007400	0000-0003-1404-1834
Su, Junfeng	Xi'an University of Architecture and Technology	14021906000	0000-0001-8434-0851
Wang, Zhao	Xi'an University of Architecture and Technology	57208427889	nil
Ali, Amjad	Xi'an University of Architecture and Technology	56991900200	nil
Achal, Varennyam	Guangdong Technion-Israel Institute of Technology	15076974200	0000-0001-5444-7746
Cheng, Liang	Jiangsu University	55474102700	0000-0002-1767-2108
Kawasaki, Satoru	Hokkaido University	54782723900	nil
Dejong, Jason T.	College of Engineering	7005368829	0000-0002-9809-955X
Gerlach, Robin	Montana State University	57189020312	nil
Liu, Hanlong	Chongqing University	26643629700	0000-0002-9411-4660

**Table S3.** Other information about top Journals in the field.

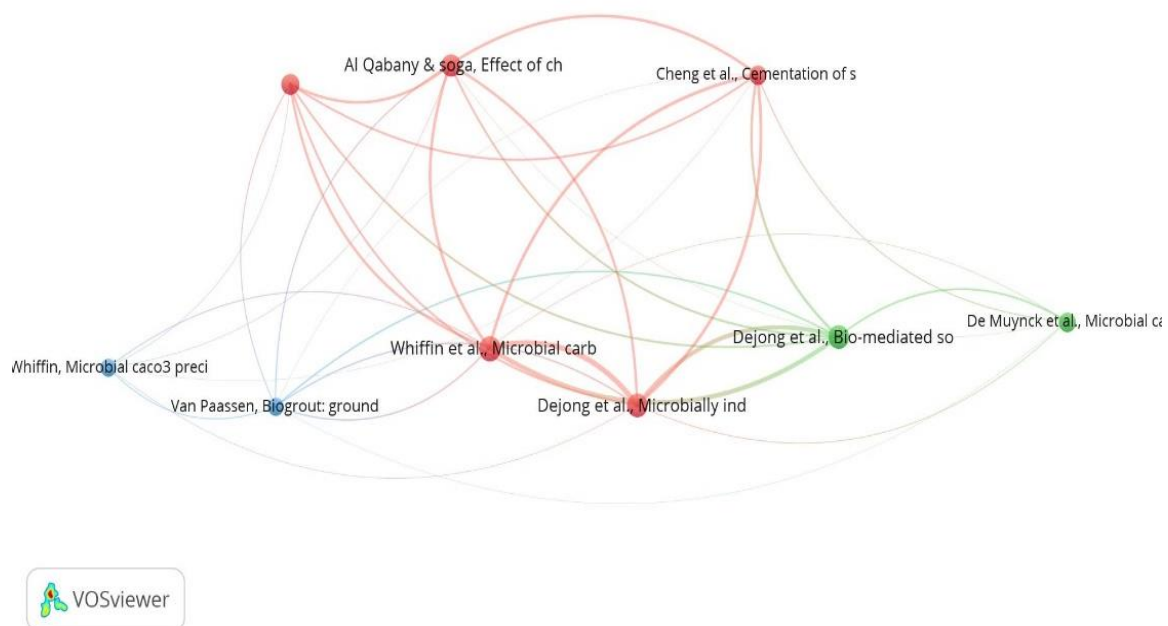
<b>Journals</b>	<b>Country of Journal</b>	<b>CiteScore 2023</b>	<b>Quartile ranking</b>
Construction and Building Materials	United Kingdom	13.5	Q1
Journal of Petroleum Science and Engineering	Netherlands	11.1	Q1
Journal of Geotechnical and Geoenvironmental Engineering	United States	7.3	Q1
Marine and Petroleum Geology	Netherlands	8.6	Q1
Journal of Materials in Civil Engineering	United States	5.7	Q1
Journal of Natural Gas Science and Engineering	Netherlands	8.9	Q1
Chemosphere	United Kingdom	15.6	Q1
Geomicrobiology Journal	United Kingdom	4.7	Q2
Acta Geotechnica	Germany	9.7	Q1
Journal of Environmental Management	United States	13.4	Q1

**Table S4.** Top 15 author keywords

<b>Keywords</b>	<b>Occurrences</b>	<b>Total strengths</b>	<b>link</b>
MICP	162	222	
Calcium carbonate	63	106	
Permeability	60	109	
<i>Sporosarcina pasteurii</i>	57	95	
Bio mineralization	55	81	
Urease	51	116	
Bacteria	36	73	
Self-healing	35	65	
Soil improvement	35	68	
Calcite	34	68	
Pores structure	33	32	
Porosity	32	48	
Concrete	30	53	
Biocementation	26	47	
pore size distribution	24	30	

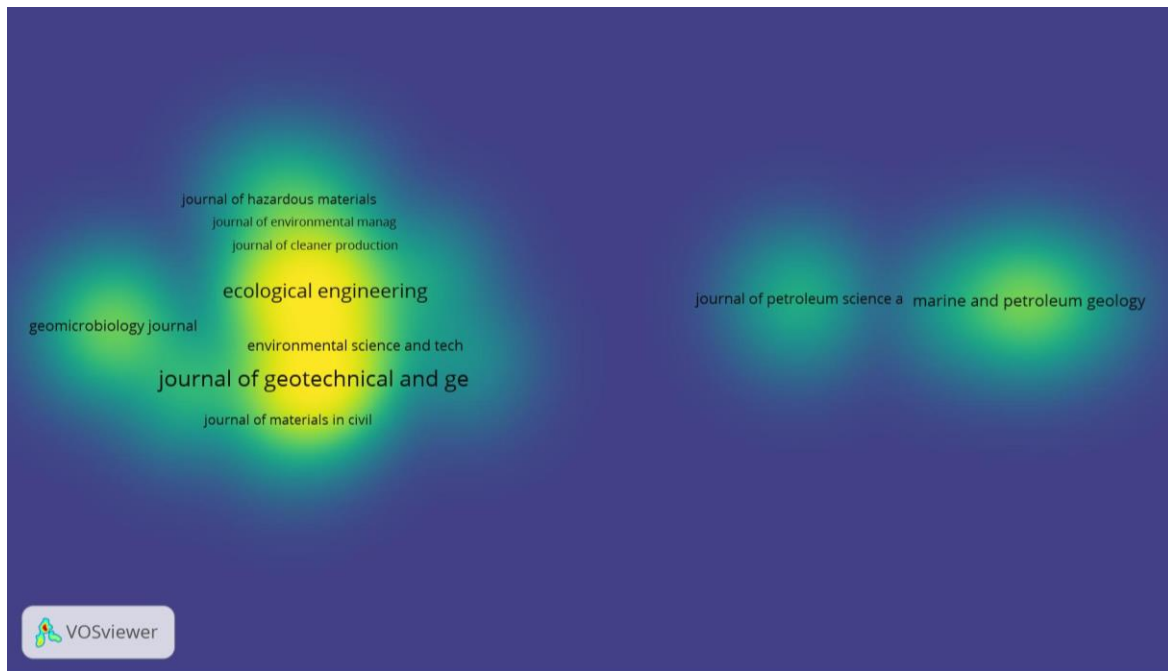
**Table S5.** Evolution of MICP research from 1999 to 2024

Research era/phase	Key trends
1999-2005	Initial studies laid the foundation for MICP, focusing on microbial processes and calcite precipitation mechanisms. Research primarily conducted in laboratory settings.
2006-2012	Increased interest in MICP applications for soil stabilization, bioremediation, and construction. Exploration of different microorganisms and nutrient formulations.
2013-2017	Significant growth in research output, shifting towards field trials and practical applications. Focus on optimizing MICP for large-scale applications and material durability.
2018-2024	Continued growth in research, addressing challenges and limitations. Focus on hydrodynamics, novel microbial strains, and additives for enhanced performance and applications.

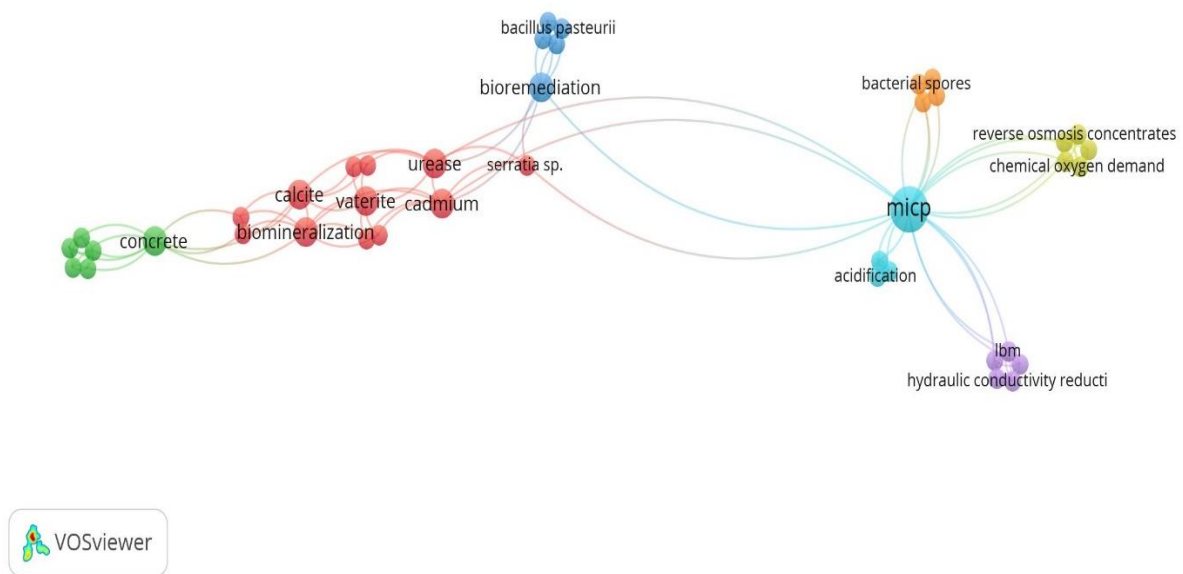


**Figure S1.** Network visualisation of the top most co-cited references in the field. The online map is available at <https://bit.ly/3UMSpYG>

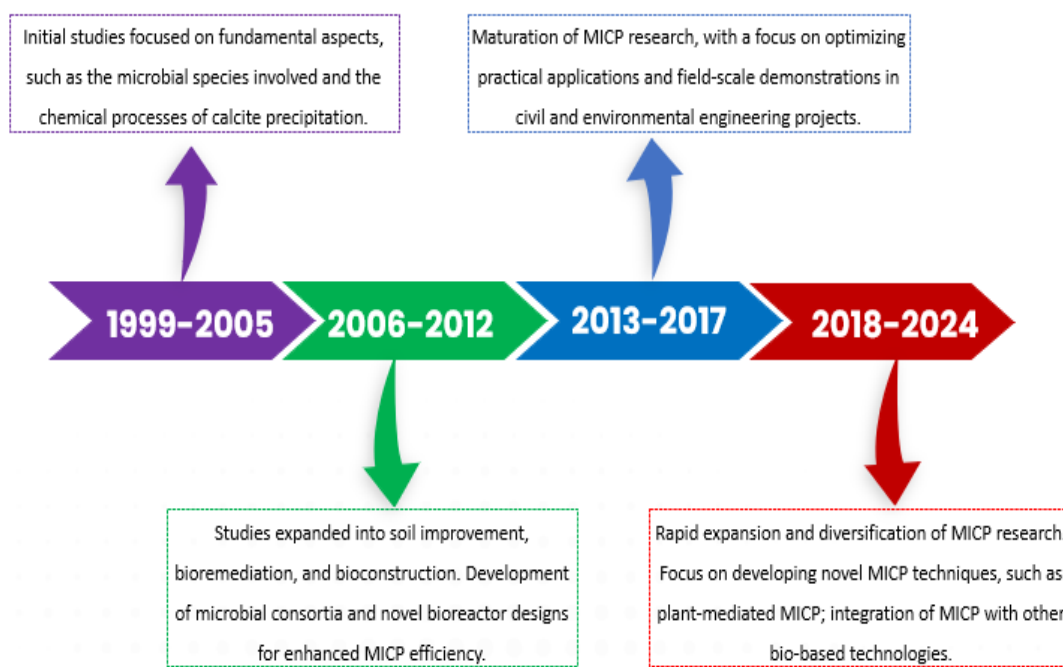




**Figure S2.** Network visualisation of bibliographic coupling of journals. The online map is available at <https://bit.ly/3wgsZZa>



**Figure S3.** Network visualisation of co-occurrence of author keywords from only 2024 publications. The online map is available at <https://bit.ly/3OOqCDq>



**Figure S4.** Research evolution and focus in the field.