

# Citation Evidence Report

EB-1B Petition — Outstanding Professor or Researcher

8 CFR § 204.5(i)(3) · Authorship + Original Contributions

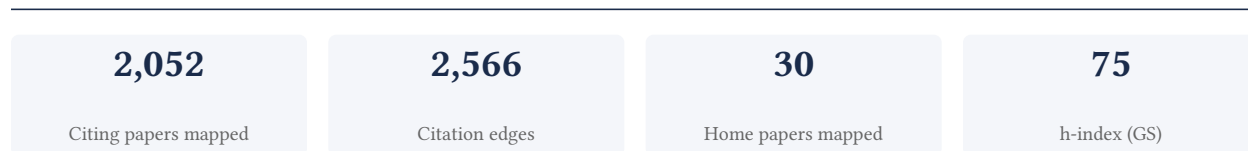
## Baoguo Han

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[Google Scholar profile](#)

**Generated 2026-05-21 by CiteMap.** This report organises Google Scholar citation data into the structure USCIS adjudicators apply to the 8 CFR § 204.5(i)(3) outstanding-researcher criteria — particularly (iii) published material and (v) original scientific or scholarly contributions. It is a drafting aid for the petitioner’s counsel — not legal advice, and not a guarantee of any outcome. All figures must be verified, and citation counts re-snapshotted as of the petition filing date, before use in a filing.

## A. Overview & Filtering Statement



### Filtering statement – methodology & limits

Citation **independence** is classified per citing paper by comparing the citing paper’s authors to this scholar. *Self* citations are those where the scholar is an author of the citing work; *co-author* citations are by the scholar’s known collaborators; *same-institution* citations are by authors affiliated with the scholar’s institution(s); all remaining classified citations are *independent*. Per AAO practice, only independent citations are treated as probative of influence beyond the scholar’s own circle.

**Known limitations – counsel must verify.** (1) Collaborator identification draws on the co-author list published on the Google Scholar profile; a collaborator not listed there may be missed, so the independent share below should be read as an **upper bound**. (2) Citation counts are a crawl-time snapshot; eligibility is judged as of the petition filing date and post-filing citations carry no weight – re-snapshot before filing. (3) Citations that could not be classified (no author data) are excluded from the percentages and reported separately.

## B. Citation Independence

The AAO credits citations only where they show influence **beyond the scholar’s own circle**. Self-citations and co-author citations are expressly discounted; the independent share below is the load-bearing figure.

**91.0% independent** of 188 classified citing papers

Citation type	Count
Independent	171
Self-citation	13
Co-author	4
Same-institution	0

1,864 citing papers could not be classified (no author data) and are excluded from the percentages above.

## C. Significant Contributions & Their Citation Evidence

Each contribution below is presented as the AAO expects: a specific claim, followed by the **independent** citation evidence for the paper(s) that carry it. Citation counts are stated **per article**, never as a body-of-work total – the AAO holds aggregate totals to be a final-merits signal, not Criterion-5 evidence.

Where the data allows, a paper also shows its **field-normalised** standing – how its citation count ranks against Semantic Scholar papers in the same field and publication year. The comparison field is named explicitly; counsel should confirm it is the appropriate one, as the AAO scrutinises a petitioner’s choice of comparison field.

## Contribution 1

### Claim – Contribution 1

*The researcher pioneered intrinsic self-sensing cementitious composites using carbon nanotubes, establishing a foundational framework for smart infrastructure monitoring that has been widely adopted by the independent scientific community.*

The researcher's contribution centers on the development of self-sensing carbon nanotube/cement composites for traffic monitoring, as demonstrated in a seminal 2009 paper. This core work established the technical basis for integrating nanomaterials into concrete to enable structural health monitoring capabilities.

This line of work appears to address the need for intelligent infrastructure materials by moving beyond passive construction components. The subsequent 2015 review on intrinsic self-sensing concrete and the 2017 study on nano-core effects suggest the researcher systematically expanded this initial concept, refining the understanding of how nano-engineering enhances the sensing properties of cementitious composites.

The significance of this research is evidenced by substantial citation counts, with the core paper cited 517 times and the follow-up review cited 918 times. Notably, 91.0% of classified citations originate from independent researchers, indicating that this work has served as a critical reference point for the broader field rather than merely circulating within the researcher's immediate network.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 63 · 1 flagged influential by Semantic Scholar

#### CORE PAPER

#### [A self-sensing carbon nanotube/cement composite for traffic monitoring](#)

2009 · Nanotechnology 20 (44), 445501, 2009 · 517 citations (GS)

Field-normalised: 398 Semantic Scholar citations place it in the top 1% of Engineering papers from 2009 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	<a href="#">A critical review of carbon materials engineered electrically conductive cement concrete and its potential applications</a>	City University of Hong Kong, Harbin Institute of Technology, The Hong Kong Polytechnic University	China	—
2	<a href="#">Electrical and piezoresistive properties of cement composites with carbon nanomaterials</a>	Hanyang University, Korea Railroad Research Institute, Korea University	South Korea, United States	—
3	<a href="#">Conductive grout with multiwalled carbon nanotubes for water cut-off self-monitoring in underground tunnels</a>	Incheon National University, Jeonbuk National University, Korea Railroad Research Institute	South Korea	—
4	<a href="#">Assessing the conductive and thermoresistive behaviours of asphalt mixtures incorporating graphene nanoplatelets (GNPs) and Electric Arc Furnace Slag (EAFS)</a>	Roma Tre University, Universidad Politécnica de Madrid	Italy, Spain	—
5	<a href="#">Crack identification using smart paint and machine learning</a>	University of Bologna, University of California San Diego	Italy, United States	—
6	<a href="#">Electrostatic self-assembly effect of Fe<sub>3</sub>O<sub>4</sub> nanoparticles on performance of carbon nanotubes in cement-based materials</a>	Shandong Hi-speed Group Co. Ltd, Shandong University	China	—

No.	Citing paper	Citing institution(s)	Country	S2
7	<a href="#">Advances and significances of nanoparticles as concrete additives: a comprehensive review</a>	IUBAT-International University of Business Agriculture and Technology	Bangladesh	—
8	<a href="#">Cements in the 21st century: Challenges, perspectives, and opportunities</a>	BASF, NASA Marshall Space Flight Center, National Institute of Standards and Technology	Canada, Germany, United Kingdom	—
9	<a href="#">3D printing of highly stretchable strain sensors based on carbon nanotube nanocomposites</a>	University of Oklahoma	United States	—
10	<a href="#">Determination of rhodamine b in cosmetics, candy, water, and plastic by a novel multiwalled carbon nanotube (mwcnt)@ zinc oxide@ magnetite nanocomposite for ...</a>	Erciyes University, Hasan Kalyoncu University	Turkey	—
11	<a href="#">Integrated sensors in advanced composites: A critical review</a>	University of British Columbia	Canada	—
12	<a href="#">Dispersion of carbon nanotubes in aqueous cementitious materials: A review</a>	China Construction Eighth Bureau, Qingdao University of Technology	China	—
13	<a href="#">Strain sensitivity of steel-fiber-reinforced industrial smart concrete</a>	Dokuz Eylül University, University of Virginia	Turkey, United States	—
14	<a href="#">The combined effect of carbon fiber and carbon nanotubes on the electrical and self-heating properties of cement composites</a>	Atatürk University	Turkey	—
15	<a href="#">Enhanced thermoelectric properties of carbon fiber-reinforced cement composites (CFRCs) utilizing Bi<sub>2</sub>Te<sub>3</sub> with three doping methods</a>	Hohai University, Shanghai Construction Group CO., Ltd., Sichuan College of Architectural Technology	China	—
16	<a href="#">Physical Origin of Temperature Induced Activation Energy Switching in Electrically Conductive Cement</a>	University of Bath, University of Shanghai for Science and Technology	China, United Kingdom	—
17	<a href="#">A review on polymer/cement composite with carbon nanofiller and inorganic filler</a>	Quaid-i-Azam University	Pakistan	—
18	<a href="#">The synergistic effect of CNTs-polymeric surfactant on the properties of concrete nanocomposites: Comparative study</a>	King Khalid University, Mersin University, Yesilyurt High School	Saudi Arabia, Turkey	—
19	<a href="#">Piezoresistive properties of CNT reinforced cementitious composites</a>	Chung-Ang University, Ulsan University	South Korea	—
20	<a href="#">Performance of carbon nanotubes in mortar using different surfactants</a>	The American University in Cairo	Egypt	—
21	<a href="#">Liquid exfoliated graphene smart layer for structural health monitoring of composites</a>	Institute of Space Technology, National University of Sciences and Technology, University of Engineering and Technology—Taxila	Pakistan	—
22	<a href="#">Strain-sensing characteristics of self-consolidating concrete with micro-carbon fibre</a>	National Institute of Technology Srinagar, National Institute of Technology, Srinagar	India	—

Independent citing papers only; self- and co-author citations excluded. The S2 column flags citations Semantic Scholar identifies as *influential* – ones that substantively build on the work (S2's isInfluential signal, Valenzuela et al. 2015) – the “built on / relied upon” pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

#### FOLLOW-UP WORK

### **Intrinsic self-sensing concrete and structures: A review**

2015 · Measurement 59, 110-128, 2015 · 918 citations (GS)

Field-normalised: 695 Semantic Scholar citations place it in the top 1% of Engineering papers from 2015 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	<a href="#">A critical review of carbon materials engineered electrically conductive cement concrete and its potential applications</a>	City University of Hong Kong, Harbin Institute of Technology, The Hong Kong Polytechnic University	China	Influential
2	<a href="#">Smart structures with embedded flexible sensors fabricated by fused deposition modeling-based multimaterial 3D printing</a>	City University of Hong Kong, Southern University of Science and Technology	China	—
3	<a href="#">Structural engineering from an inverse problems perspective</a>	Coastal Carolina University, Purdue University, University of Oulu	China, Finland, United Kingdom	—
4	<a href="#">Self-powered weigh-in-motion system combining vibration energy harvesting and self-sensing composite pavements</a>	University of Granada, University of Perugia	Italy, Spain	—
5	<a href="#">Recent advances in embedded technologies and self-sensing concrete for structural health monitoring</a>	Politecnico di Torino	Italy	—
6	<a href="#">A review of electrically conductive cement concrete pavement for sustainable snow-removal and deicing: Road safety in cold regions</a>	The University of Texas Rio Grande Valley	United States	—
7	<a href="#">Electrical and piezoresistive properties of cement composites with carbon nanomaterials</a>	Hanyang University, Korea Railroad Research Institute, Korea University	South Korea, United States	—
8	<a href="#">Highly oriented direct-spun carbon nanotube textiles aligned by in situ radio-frequency fields</a>	BSC Associates Ltd, IMDEA Materials Institute, Q-Flo Limited	Spain, U.K, United Kingdom	—
9	<a href="#">Conductive grout with multiwalled carbon nanotubes for water cut-off self-monitoring in underground tunnels</a>	Incheon National University, Jeonbuk National University, Korea Railroad Research Institute	South Korea	—
10	<a href="#">Self-Sensing concrete: A data-driven approach to comprehensive analysis and review</a>	Louisiana State University, University of Cambridge	United Kingdom, United States	—
11	<a href="#">Smart cement-sensor composite: The evolution of nanomaterial in developing sensor for structural integrity</a>	VIT University	India	—

No.	Citing paper	Citing institution(s)	Country	S2
12	<a href="#">Synergistic effects of hybrid microfibers on mechanical, thermal, and microstructural characterization of nanocomposites</a>	King Khalid University, University of Engineering and Technology Taxila	Kingdom of Saudi Arabia, Pakistan	—
13	<a href="#">Mechanical strength and self-sensing capacity of smart cementitious composite containing conductive rubber crumbs</a>	Huazhong University of Science and Technology, Iowa State University, University of Technology Sydney	Australia, China, United States	—
14	<a href="#">Cementitious composites modified by nanocarbon fillers with cooperation effect possessing excellent self-sensing properties</a>	China Construction Second Engineering Bureau Co., Ltd, East China Jiaotong University, Hunan University of Arts and Science	China	—
15	<a href="#">The workability, mechanical, and electrical properties of steel fiber-reinforced SCC incorporating ultra-fine copper slag as fine aggregate</a>	Adiyaman University, Bitlis Eren University, Inonu University	Turkey	—
16	<a href="#">Piezoresistive/piezoelectric intrinsic sensing properties of carbon nanotube cement-based smart composite and its electromechanical sensing mechanisms: A ...</a>	China Construction Second Engineering Bureau Co., Ltd, Qingdao University of Technology	China	—
17	<a href="#">Study of temperature and moisture effects on piezoresistive behavior of graphene oxide-reinforced cementitious composites</a>	Chongqing University	China	—
18	<a href="#">Effect of moisture on electrical resistivity and self-sensing behavior of a cement paste</a>	Universidade Federal do Rio de Janeiro	Brazil	—
19	<a href="#">Assessing the conductive and thermoresistive behaviours of asphalt mixtures incorporating graphene nanoplatelets (GNPs) and Electric Arc Furnace Slag (EAFS)</a>	Roma Tre University, Universidad Politécnica de Madrid	Italy, Spain	—
20	<a href="#">Improvement of the electrical conductivity of carbon fiber reinforced polymer by incorporation of nanofillers and the resulting thermal and mechanical behavior</a>	Université de Technologie de Compiègne	France	—
21	<a href="#">Evaluation of 3D robotic spray parameters on the performance of the developed sensing functional cementitious coating</a>	Nanyang Technological University	Singapore	—
22	<a href="#">Crack identification using smart paint and machine learning</a>	University of Bologna, University of California San Diego	Italy, United States	—
23	<a href="#">Controlling the Formation of Electroactive Graphene-Based Cementitious Composites: Towards Structural Health Monitoring of Civil Structures</a>	Université de Strasbourg	France	—
24	<a href="#">Self-damage sensing of electrically conductive self-compacting concrete incorporating short carbon fibers</a>	National Institute of Technology Srinagar	India	—

No.	Citing paper	Citing institution(s)	Country	S2
25	<a href="#">Piezoresistive responses of CNT cement composites under different load characteristics</a>	Becton Dickinson Medical Devices, Chang'an University, Southern University of Science and Technology	China, People's Republic of China	—
26	<a href="#">Electrostatic self-assembly effect of Fe3O4 nanoparticles on performance of carbon nanotubes in cement-based materials</a>	Shandong Hi-speed Group Co. Ltd, Shandong University	China	—
27	<a href="#">Advances and significances of nanoparticles as concrete additives: a comprehensive review</a>	IUBAT-International University of Business Agriculture and Technology	Bangladesh	—
28	<a href="#">Evaluation of piezoresistive response and freeze-thaw damage of self-sensing cement mortar based on conductive fibre</a>	Nanjing University of Science and Technology, Southeast University	China	—
29	<a href="#">Effects of multi-wall carbon nanotubes (MW-CNTs) on strength enhancement and microstructural changes in high-performance concrete</a>	PET Engineering College, University College of Engineering	India	—
30	<a href="#">Accurate self-damage detection by electrically conductive epoxy/graphene nanocomposite film</a>	Nazarbayev University, Shenyang Aerospace University, University of South Australia	Australia, China, Kazakhstan	—

Showing the 30 most-cited of 36 independent citing papers.

Independent citing papers only; self- and co-author citations excluded. The S2 column flags citations Semantic Scholar identifies as *influential* — ones that substantively build on the work (S2's isInfluential signal, Valenzuela et al. 2015) — the “built on / relied upon” pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

#### FOLLOW-UP WORK

##### [Nano-core effect in nano-engineered cementitious composites](#)

2017 · Composites Part A: Applied Science and Manufacturing 95, 100-109, 2017 · 440 citations (GS)

Field-normalised: 368 Semantic Scholar citations place it in the top 1% of Materials Science papers from 2017 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	<a href="#">Oxidation of carbon nanotubes for improving the mechanical and electrical properties of oil-well cement-based composites</a>	Italian Institute of Technology, Politecnico di Torino	Italy	—
2	<a href="#">Effect of modified nano-titanium and fly ash on ultra-high-performance concrete properties</a>	Islamic University of Gaza, Jazan University, Najran University	Egypt, Palestine, Saudi Arabia	—
3	<a href="#">A review on multi-scale toughening and regulating methods for modern concrete: from toughening theory to practical engineering application</a>	Southeast University	China	—
4	<a href="#">Enhancing the mechanical performance of fiber-reinforced polymer composites using carbon nanotubes as an effective nano-phase reinforcement</a>	Anhui University of Technology, Beihang University, Tianjin University	China, P. R. China, United States	—

No.	Citing paper	Citing institution(s)	Country	S2
5	<a href="#">Microstructural characteristics and nano-modification of interfacial transition zone in concrete: A review</a>	Chengdu University of Technology	China	—

Independent citing papers only; self- and co-author citations excluded. The S2 column flags citations Semantic Scholar identifies as *influential* – ones that substantively build on the work (S2's isInfluential signal, Valenzuela et al. 2015) – the “built on / relied upon” pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

## Contribution 2

### Claim – Contribution 2

*The researcher pioneered the conceptual framework for smart, multifunctional concrete, subsequently expanding this foundation to address 3D printing and self-healing capabilities for sustainable infrastructure.*

The researcher established a foundational contribution to sustainable infrastructure through the 2017 paper 'Smart and multifunctional concrete toward sustainable infrastructures.' This core work serves as the anchor for a broader research trajectory focused on enhancing concrete's functional properties.

This line of work appears to address the need for advanced materials that go beyond traditional structural roles. By progressing from general multifunctionality to specific applications like 3D printing and self-healing composites in subsequent reviews, the researcher systematically expanded the scope of intelligent concrete technologies.

The significance of this contribution is evidenced by substantial citation counts, with the core paper accumulating 445 citations and follow-up reviews reaching 697 and 572 citations respectively. Furthermore, 91.0% of classified citations originate from independent researchers, indicating broad adoption and impact across the global scientific community.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 98 · 1 flagged influential by Semantic Scholar

### CORE PAPER

#### [Smart and multifunctional concrete toward sustainable infrastructures](#)

2017 · Springer Singapore, 2017 · 445 citations (GS)

Field-normalised: 232 Semantic Scholar citations place it in the top 1% of Engineering papers from 2017 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	<a href="#">Recent advances in embedded technologies and self-sensing concrete for structural health monitoring</a>	Politecnico di Torino	Italy	—
2	<a href="#">Smart cement-sensor composite: The evolution of nanomaterial in developing sensor for structural integrity</a>	VIT University	India	—
3	<a href="#">Cementitious composites modified by nanocarbon fillers with cooperation effect possessing excellent self-sensing properties</a>	China Construction Second Engineering Bureau Co., Ltd, East China Jiaotong University, Hunan University of Arts and Science	China	—
4	<a href="#">Piezoresistive/piezoelectric intrinsic sensing properties of carbon nanotube cement-based</a>	China Construction Second Engineering Bureau Co., Ltd,	China	—

No.	Citing paper	Citing institution(s)	Country	S2
	<a href="#">smart composite and its electromechanical sensing mechanisms: A ...</a>	Qingdao University of Technology		
5	<a href="#">Electrostatic self-assembly effect of Fe3O4 nanoparticles on performance of carbon nanotubes in cement-based materials</a>	Shandong Hi-speed Group Co. Ltd, Shandong University	China	—
6	<a href="#">Top challenges to widespread 3D concrete printing (3DCP) adoption—a review</a>	Amrita School of Engineering, CSIR-Structural Engineering Research Centre	India	—
7	<a href="#">SiWa: See into walls via deep UWB radar</a>	A*STAR, Nanyang Technological University	Singapore	—
8	<a href="#">Impact of bacterial admixtures on the compressive and tensile strengths, permeability, and pore structure of ternary mortars: Comparative study of ureolytic and ...</a>	Antex Western Ltd/ACM Technologies, Technion - Israel Institute of Technology, University of Toronto	Canada, Israel	—
9	<a href="#">Microbes in bioconcrete technology: exploring the fundamentals and state-of-the-art findings for advancing civil engineering</a>	National Cheng Kung University, Sanjay Gandhi Smriti Govt. P.G. Auto. College, UIT, RGPV	India, Taiwan	—
10	<a href="#">Physical Origin of Temperature Induced Activation Energy Switching in Electrically Conductive Cement</a>	University of Bath, University of Shanghai for Science and Technology	China, United Kingdom	—
11	<a href="#">A comprehensive review of radiation shielding concrete: Properties, design, evaluation, and applications</a>	Canadian Nuclear Laboratories Limited, NIT Karnataka, University of Birmingham	Canada, India, United Kingdom	—
12	<a href="#">Research and development on phase change material-integrated cloth: A review</a>	Bangladesh University of Business and Technology, Dhaka University of Engineering and Technology, Govt. College of Applied Human Science	Bangladesh	—
13	<a href="#">A review on piezoelectric fibers and nanowires for energy harvesting</a>	Deakin University, Donghua University, University of Tehran	Australia, China, Iran	—
14	<a href="#">5S multifunctional intelligent coating with superdurable, superhydrophobic, self-monitoring, self-heating, and self-healing properties for existing construction ...</a>	Hohai University, National University of Singapore, Zhengzhou University	China, Singapore	—
15	<a href="#">Determinative Effect of Axial Linearity on Single-Molecule Magnet Performance in Dinuclear Dysprosium Complexes</a>	The University of Manchester, Xi'an Jiaotong University	China, United Kingdom	—
16	<a href="#">A deep learning model for predicting the cement soil deformation modulus</a>	Army Engineering University of PLA, Changshu Institute of Technology, Soochow University	China	—
17	<a href="#">Real-time monitoring of structures under extreme loading using smart composite-based embeddable sensors</a>	Academy of Scientific and Innovative Research, CSIR-Structural Engineering Research Centre	India	<b>Influential</b>

No.	Citing paper	Citing institution(s)	Country	S2
18	<a href="#">Mechanical properties of high-strength self-compacting concrete</a>	BLDEA's Vachana Pitamaha Dr. P.G Halakatti College of Engineering and Technology, Galgotia College of Engineering, King Saud University	India, Saudi Arabia, South Korea	—
19	<a href="#">Investigation on durability of mPCM modified concrete subjected to the coupling action of carbonation and freeze-thaw cycles</a>	Central South University, Hunan City University, Xiangtan University	China	—
20	<a href="#">Carbon-Coated Sand in Cement Composites for Smart and Multifunctional Construction Materials: A Comprehensive Review</a>	King Fahd University of Petroleum and Minerals, Yonsei University	Saudi Arabia, South Korea	—
21	<a href="#">The design and operation optimization for conductive rubber heated snow melting bridge deck pavement</a>	Jilin University	China	—
22	<a href="#">Comprehensive investigation of butyl stearate as a multifunctional smart concrete additive for energy-efficient buildings</a>	Çukurova University	Turkey	—
23	<a href="#">Thermoelectric power factor of boron-doped carbon nanotubes reinforced cementitious composites</a>	Xi'an University of Architecture and Technology	China	—
24	<a href="#">Evaluation of action mechanism, mix design and some properties of photocatalytic concrete</a>	Uludag University	Turkey	—
25	<a href="#">Application of strontium aluminate europium and dysprosium doped in cement mortar as a luminescent material for the maintenance of green environments</a>	Abdul Wali Khan University, Beijing University of Technology, CECOS Univ. of IT and Emerging Sciences	China, Estonia, Indonesia	—
26	<a href="#">Durability enhancement of prestressed concrete using smart materials: integrating self-healing mechanisms and monitoring systems</a>	Huangshan University	China	—

Independent citing papers only; self- and co-author citations excluded. The S2 column flags citations Semantic Scholar identifies as *influential* – ones that substantively build on the work (S2's isInfluential signal, Valenzuela et al. 2015) – the “built on / relied upon” pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

## FOLLOW-UP WORK

### [A review of the current progress and application of 3D printed concrete](#)

2019 · Composites Part A: Applied Science and Manufacturing 125, 105533, 2019 · 697 citations (GS)

Field-normalised: 457 Semantic Scholar citations place it in the top 1% of Engineering papers from 2019 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	<a href="#">Advances in 3D printing for polymer composites: A review</a>	Northwestern Polytechnical University	China, the People's Republic of China	—
2	<a href="#">4D Printing of Multifunctional and Biodegradable PLA-PBAT-Fe3O4 Nanocomposites with</a>	Nottingham Trent University, University of Tehran	Iran, United Kingdom	—

No.	Citing paper	Citing institution(s)	Country	S2
	<a href="#">Supreme Mechanical and Shape Memory Properties</a>			
3	<a href="#">Revolutionising fabrication advances and applications of 3D printing with composite materials: a review</a>	Majmaah University	Saudi Arabia	—
4	<a href="#">3D-printed concrete: Applications, performance, and challenges</a>	Curtin University, Pabna University of Science and Technology, Prince Sattam Bin Abdulaziz University	Australia, Bangladesh, Saudi Arabia	—
5	<a href="#">Top challenges to widespread 3D concrete printing (3DCP) adoption—a review</a>	Amrita School of Engineering, CSIR-Structural Engineering Research Centre	India	—
6	<a href="#">Additive manufacturing of sustainable construction materials and form-finding structures: a review on recent progresses</a>	Nanyang Technological University, RMIT University, Stellenbosch University	Australia, Singapore, South Africa	—
7	<a href="#">Mix suitable for concrete 3D printing: A review</a>	Mahindra University	India	—
8	<a href="#">Multi-material additive manufacturing via fused deposition modeling 3D printing: A systematic review on the material feeding mechanism</a>	Baylor University, Dalian Maritime University	China, United States	—
9	<a href="#">Recent development of 3D-printing technology in construction engineering</a>	Western University	Canada	—
10	<a href="#">Mechanical properties, durability performance and interlayer adhesion of 3DPC mixtures: a state-of-the-art review</a>	Uludag University	Turkey	—
11	<a href="#">3D printable geopolymer composites reinforced with carbon-based nanomaterials—a review</a>	King Fahd University of Petroleum and Minerals, Yonsei University	Saudi Arabia, South Korea	—
12	<a href="#">Geopolymer-based applications for bridge structures: A review</a>	Gebze Technical University	Turkey	—
13	<a href="#">Machine learning approach for the flexural strength of 3D-printed fiber-reinforced concrete based on the meta-heuristic algorithm</a>	Applied Science Private University, University of Miami	Jordan, United States	—
14	<a href="#">Effect of urea on the thixotropic behavior of mixtures containing calcium aluminate cement and Portland cement</a>	Bursa Uludag University, Uludag University	Turkey	—
15	<a href="#">Long-term durability assessment of 3D printed concrete</a>	Holcim Innovation Center, University of Balamand	Lebanon	—
16	<a href="#">A review of extant literature and recent trends in residential construction waste reduction</a>	Auckland University of Technology	New Zealand	—
17	<a href="#">3D-Printed hydrogels and aerogels for water treatment and energy storage applications</a>	Council for Scientific and Industrial Research	South Africa	—
18	<a href="#">State of the art in additive manufacturing and its possible chemical and particle hazards</a>	Central Institute for Labour Protection-National Research Institute	Poland	—
19	<a href="#">A screw extrusion-based system for additive manufacturing of wood: Sodium silicate thermoset composites</a>	University of Idaho	United States	—

No.	Citing paper	Citing institution(s)	Country	S2
20	<a href="#">Evaluation of aggregates, fibers and voids distribution in 3D printed concrete</a>	Lanzhou University of Technology, National University of Singapore, Suzhou University of Science and Technology	China, Singapore	—
21	<a href="#">Mechanical and rheological properties of fiber-reinforced 3D printable concrete; in terms of fiber content and aspect ratio</a>	Uludag University	Turkey	—
22	<a href="#">Effect of air-entraining agent on hardened properties of 3D printed concrete with emphasis on permeability and air void structure</a>	Amirkabir University of Technology, University of Tehran	Iran	—
23	<a href="#">Decoding the structural interrelationships of barriers to 3D printing adoption in construction</a>	Ho Chi Minh City Open University, Industrial University of Ho Chi Minh City	Vietnam	—
24	<a href="#">Planetary robotic construction using large-scale 3D printing with sulfur concrete</a>	Louisiana State University	United States	—
25	<a href="#">Exploring Utilization of the 3D Printed Housing as Post-Disaster Temporary Shelter for Displaced People</a>	University of Texas at Arlington	United States	—
26	<a href="#">Advances in physiologically relevant actuation of shape memory polymers for biomedical applications</a>	Southern University of Science and Technology	China	—
27	<a href="#">Mechanical reinforcement course of 3D printed polypropylene-antimony doped Tin Oxide nanocomposites versus filler loading</a>	Hellenic Mediterranean University, NTNU-Norwegian University of Science and Technology	Greece, Norway	—
28	<a href="#">Concrete 3D printing of shape-optimized lattice beams incorporating nature-inspired patterns</a>	IIT Madras	India	—
29	<a href="#">Preparation of 3D-printed concrete from solid waste: Study of the relationship between steel slag characteristics and early performance in 3D printing</a>	Henan Polytechnic University	China	—
30	<a href="#">Experimental study on interfacial shear behavior of 3D printed recycled mortar</a>	Tongji University	China	—

Showing the 30 most-cited of 42 independent citing papers.

Independent citing papers only; self- and co-author citations excluded. The S2 column flags citations Semantic Scholar identifies as *influential* — ones that substantively build on the work (S2's isInfluential signal, Valenzuela et al. 2015) — the “built on / relied upon” pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

#### FOLLOW-UP WORK

##### [Self-healing cement concrete composites for resilient infrastructures: A review](#)

2020 · Composites Part B: Engineering 189, 107892, 2020 · 572 citations (GS)

Field-normalised: 401 Semantic Scholar citations place it in the top 1% of Engineering papers from 2020 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	<a href="#">Hot mixing: Mechanistic insights into the durability of ancient Roman concrete</a>	DMAT srl, Istituto Meccanica dei Materiali SA, Massachusetts Institute of Technology	Italy, Switzerland, United States	—

No.	Citing paper	Citing institution(s)	Country	S2
2	<a href="#">Toward self-healing concrete infrastructure: review of experiments and simulations across scales</a>	Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Texas A&M University	United States	—
3	<a href="#">A review on the potential of filamentous fungi for microbial self-healing of concrete</a>	Université Libre de Bruxelles, Vrije Universiteit Brussel	Belgium	—
4	<a href="#">Experimental and numerical research on healing performance of reinforced microcapsule-based self-healing polymers using nanoparticles</a>	Amirkabir University of Technology	Iran	—
5	<a href="#">The Effect of Capsulated Linseed Oil-Nano Zirconia on the Tribological Properties and Corrosion Resistance of the Epoxy Coatings</a>	K. N. Toosi University of Technology, University of Zanjan	Iran	—
6	<a href="#">Addressing the need for standardization of test methods for self-healing concrete: an inter-laboratory study on concrete with macrocapsules</a>	Cracow University of Technology, Ghent University, KU Leuven	Belgium, Italy, Latvia	—
7	<a href="#">Effects of alumina nanofibers and cellulose nanocrystals on durability and self-healing capacity of ultrahigh-performance fiber-reinforced concretes</a>	Institute of Construction Science Eduardo Torroja, Politecnico di Milano	Italy, Spain	—
8	<a href="#">Sustainable self-healing concrete technologies: a review of bacteria-induced mechanisms and their effects on structural integrity, mechanical properties and durability</a>	University of Tehran	Iran	—
9	<a href="#">SiWa: See into walls via deep UWB radar</a>	A*STAR, Nanyang Technological University	Singapore	—
10	<a href="#">Innovative approaches to enhancing concrete compressive strength: an extensive investigation of biochar-embedded and self-repairing techniques</a>	California State University Long Beach, University of Naples Federico II, University of Oklahoma	Italy, United States	—
11	<a href="#">Assessment of self-healing behavior of polypropylene fiber-reinforced cement mortar with crystalline admixture: the effects of crack widths, cracking ages, and external ...</a>	Central South University, Delft University of Technology, Dokuz Eylül University	China, Netherlands, Turkey	—
12	<a href="#">Cracking and stimulated autogenous self-healing on the sustainability of cement-based materials: a review</a>	University of Technology Sydney	Australia	—
13	<a href="#">Effect of novel gram-positive bacteria and fungi on the durability, corrosion resistance performance, and self-healing ability of concrete over various curing conditions</a>	Assuit University, Beni-Suef University, Fayoum University	Egypt	—
14	<a href="#">Strategies for Developing Superhydrophobic Surfaces on Cement-Based Materials Using Stearic Acid: A Review</a>	Shandong University of Science and Technology, Taishan University	China	—
15	<a href="#">Nature-inspired hierarchical materials</a>	Corning Incorporated, Imperial College London, Politecnico di Torino	China, Italy, United Kingdom	—
16	<a href="#">Biotrapping ureolytic Bacteria on sand to improve the efficiency of Biocementation</a>	Montana State University	United States	—

No.	Citing paper	Citing institution(s)	Country	S2
17	<a href="#">Unlocking the potential of bacterial self-healing in concrete: applications, and challenges for sustainable infrastructure</a>	National Institute of Technology Patna	India	—
18	<a href="#">Impact of bacterial admixtures on the compressive and tensile strengths, permeability, and pore structure of ternary mortars: Comparative study of ureolytic and ...</a>	Antex Western Ltd/ACM Technologies, Technion - Israel Institute of Technology, University of Toronto	Canada, Israel	—
19	<a href="#">Microbial self-healing concrete: computational approaches and material advancements</a>	Pegaso Telematic University, University of Rome "Tor Vergata"	Italy, Spain	—
20	<a href="#">Optimization of the self-healing efficiency of bacterial concrete using impregnation of three different precursors into lightweight aggregate</a>	Louisiana State University, Louisiana Transportation and Research Center, Sam Houston State University	United States	—
21	<a href="#">Comparative study on the strength behavior of self-healing concrete using silica gel and bacteria as healing agents</a>	Achira Labs Pvt. Ltd., Kamaraj College of Engineering and Technology	India	—
22	<a href="#">Nanoscale Characterization of Fungal-Induced CaCO<sub>3</sub> Precipitation: Implications for Self-Healing Concrete</a>	Lund University, MAX IV Laboratory, University of Bayreuth	Germany, Sweden	—
23	<a href="#">A micromechanical damage-healing model for encapsulation-based self-healing polymer composites under tensile loading</a>	University of Isfahan	Iran	—
24	<a href="#">Self-Healing and Joule Heating of Electrically Conductive CNT/BIIR Composite Films</a>	Dongguk University-Seoul Campus, Korea Carbon Industry Promotion Agency, Korea Institute of Science and Technology	South Korea	—
25	<a href="#">A comprehensive review of encapsulation-based self-healing concrete for construction applications</a>	Pegaso Telematic University, University of Naples Partenope, University of Rome "Tor Vergata"	Italy, Spain	—
26	<a href="#">Long-term self-healing efficiency of bioconcrete based on integrated sulfate-and nitrate-reducing bacterial granules</a>	Australia's Nuclear Science and Technology Organisation, University of Wollongong, Univ. of Wollongong	Australia	—
27	<a href="#">Self-healing concrete: application of monod's approach for modeling Bacillus pseudofirmus growth curves</a>	Czech Technical University in Prague	Czech Republic	—
28	<a href="#">Microbes in bioconcrete technology: exploring the fundamentals and state-of-the-art findings for advancing civil engineering</a>	National Cheng Kung University, Sanjay Gandhi Smriti Govt. P.G. Auto. College, UIT, RGPV	India, Taiwan	—
29	<a href="#">Post-treatment bacterial self-healing for high-temperature-induced damage in concrete: toward enhanced durability and sustainability</a>	Islamic Azad University, Shahid Ashrafi Esfahani University, University of Hertfordshire	Australia, Iran, United Kingdom	—
30	<a href="#">Self-Healing Mechanisms of Cement-Based Materials Including Different Ion Complexing Agents</a>	Harbin Institute of Technology, Rocket Force University of Engineering, Suzhou University of Science and Technology	China	—

Independent citing papers only; self- and co-author citations excluded. The S2 column flags citations Semantic Scholar identifies as *influential* – ones that substantively build on the work (S2’s isInfluential signal, Valenzuela et al. 2015) – the “built on / relied upon” pattern the AAO credits. Counsel should quote the citing text for the strongest of these.

### Contribution 3

#### Claim – Contribution 3

*The researcher pioneered embedded piezoresistive cement-based sensors for structural stress and strain monitoring, establishing a foundational methodology widely adopted by independent scholars.*

CLAIM: The researcher’s seminal 2007 paper, “Embedded piezoresistive cement-based stress/strain sensor,” represents a core contribution to the field of smart infrastructure materials. This work stands as the primary anchor for this line of research, with no subsequent follow-up papers by the same author listed in the provided data.

ORIGINALITY: The title suggests the introduction of a novel sensing mechanism that integrates piezoresistive properties directly into cementitious matrices. This approach appears to address the challenge of embedding durable, functional sensors within structural concrete, offering a method for real-time stress and strain monitoring that was likely distinct from external or discrete sensor technologies prevalent at the time.

SIGNIFICANCE: The work has achieved substantial recognition, accumulating 357 citations. Notably, 91.0% of the classified citing papers originate from independent researchers, indicating that the methodology has been widely adopted and validated by the broader scientific community rather than remaining confined to the researcher’s immediate circle. This high degree of independent uptake underscores the utility and foundational nature of the contribution.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 0

#### CORE PAPER

#### [Embedded piezoresistive cement-based stress/strain sensor](#)

2007 · Sensors and Actuators A: Physical 138 (2), 294-298, 2007 · 357 citations (GS)

Field-normalised: 272 Semantic Scholar citations place it in the top 5% of Materials Science papers from 2007 indexed by Semantic Scholar, by citation count.

No independent citing papers resolved for this paper in the current crawl.

## D. Citing-Institution Prestige & Geography

### Top citing institutions

Institution	Country	World ranking	Citing papers
Dalian University of Technology	China	SCImago #250 · THE 401–500 · QS =482	11
New York Institute of Technology	United States	SCImago #4232	9
University of Tehran	Iran	SCImago #1161 · THE 401–500 · QS 322	4
Harbin Institute of Technology, Shenzhen	China	–	4
Harbin Institute of Technology	China	SCImago #56 · THE =131 · QS 256	4
Uludag University	Turkey	SCImago #5118	4

Institution	Country	World ranking	Citing papers
Politecnico di Torino	Italy	SCImago #1164 · THE 401–500 · QS 242	4
University of Perugia	Italy	SCImago #1848 · QS 801-850	3
Southern University of Science and Technology	People's Republic of China	SCImago #561 · THE =160 · QS =343	3
Iowa State University	United States	SCImago #897 · THE 401–500 · QS 449	3
East China Jiaotong University	China	SCImago #6170	3
University of Cambridge	United Kingdom	SCImago #63 · THE =3 · QS 6	3
Nanyang Technological University	Singapore	SCImago #137	3
Central South University	China	SCImago #42 · THE 251–300 · QS =491	3
Amirkabir University of Technology	Iran	SCImago #4657 · THE 351–400 · QS =456	3

### Geographic distribution of citing authors

Country	Citing papers
China	62
United States	40
India	19
Turkey	15
United Kingdom	14
Italy	14
Iran	11
Australia	11
Saudi Arabia	8
Spain	8
South Korea	8
Canada	7

Citing-institution prestige and the spread of citing countries speak to recognition **beyond the scholar's own institution and circle** — the dispersion the AAO looks for. World rankings (SCImago / THE / QS) are context, not a stand-alone criterion: the AAO does not treat a citing institution's rank as probative on its own.

## F. AAO Precedent Considerations

### Pre-filing self-check (AAO denial patterns)

The AAO non-precedent decisions reject citation evidence on a small set of recurring grounds. Confirm the petition addresses each before filing:

- Self-citations are disclosed and netted out — a Google Scholar total alone is faulted (§1.1).
- Evidence is per individual article, not a body-of-work aggregate total (§1.2).

- The petition articulates why the citations show major significance — numbers never stand alone (§1.5).
- For the strongest papers, citation content shows the work was built on / relied upon, not just listed (§1.6, §2.2).
- Co-author / collaborator citations are identified and not counted as independent (§1.7).
- Recognition is shown beyond the scholar's own institution and circle (§1.8).
- Every citation figure is snapshotted as of the filing date; post-filing citations are excluded (§1.9).
- Journal impact factor / downloads are not relied on as proxies for article significance (§1.10, §1.12).
- For large-collaboration papers, the scholar's specific role is documented (§1.13).
- Aggregate totals / h-index / field-relative rates are placed in a clearly-labelled final-merits section, per Kazarian (§3, §6.1.7).

### Disclaimer

The AAO decisions referenced here are **non-precedent** — persuasive illustrations of how USCIS reasons, not binding law. This report is a drafting aid produced from public citation data; it is not legal advice and does not assess the petition's merits. All analysis must be reviewed by qualified immigration counsel.

## G. Citation Evidence Index

Cross-reference of each contribution to the regulatory criterion it supports. Counsel should map these to the petition's exhibit numbers.

Contribution	Core paper	Indep. cites	Supports
Contribution 1	A self-sensing carbon nanotube/cement composite for traffic monitoring	63	8 CFR 204.5(i)(3) — Outstanding Researcher
Contribution 2	Smart and multifunctional concrete toward sustainable infrastructures	98	8 CFR 204.5(i)(3) — Outstanding Researcher
Contribution 3	Embedded piezoresistive cement-based stress/strain sensor	0	8 CFR 204.5(i)(3) — Outstanding Researcher