

Electronic Supplementary Material

Advances in iron-based nanomaterials for mercury removal in water: trends and mechanisms

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Data collection and Search strategy

The literature survey for the scientometric analysis was conducted in the Scopus and Web of Science databases on 7 November 2025, using the search strings listed in Table S1. These two databases were selected due to their reliability and comprehensive coverage, ensuring consistent acquisition and construction of the dataset. Google Scholar was consulted to verify articles not captured in the merged database; however, because these records were either duplicates or outside the defined scope, they were not included in the final dataset.

Table S1. Search strings used in Scopus and Web of Science databases for the scientometric survey on iron-based nanomaterials applied to mercury (Hg) remediation (1995-2025). The search terms were queried using Boolean operators (AND/OR), accounting for variations in mercury nomenclature, iron-based nanomaterials, and environmental matrices. Truncation (*) was applied to capture term derivatives.

Database	String
Scopus	TITLE-ABS-KEY (mercury OR "mercuric" OR "Hg(II)" OR "Hg0" OR "Hg0" OR "methylmercury" OR "methyl mercury") AND TITLE-ABS-KEY ("iron nanoparticle" OR "iron nanoparticles" OR "zero-valent iron" OR "nZVI" OR "iron oxide nanoparticle" OR magnetite OR maghemite OR hematite OR goethite OR "Fe3O4" OR "Fe2O3" OR "Fe(0)" OR "Fe oxide") AND TITLE-ABS-KEY (remediation OR removal OR treat* OR adsorb* OR immobiliz* OR sequestrat* OR capture OR "water" OR "aquatic" OR river OR lake OR groundwater OR "mine" OR "mining")
Web of Science	TS=(mercury OR mercuric OR "Hg(II)" OR "methylmercury" OR "methyl mercury") AND TS=("iron nanoparticle" OR "zero-valent iron" OR nZVI OR "iron oxide nanoparticle" OR magnetite OR maghemite OR hematite OR goethite OR "Fe3O4" OR "Fe2O3") AND TS=(remediation OR removal OR treat* OR adsorb* OR immobiliz* OR sequestrat* OR water OR aquatic OR river OR groundwater OR mine OR mining)

After data export, both datasets were imported into Bibliometrix/Biblioshiny (RStudio) and merged to generate a single dataset and remove duplicate records. The principles guiding data evaluation followed the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol, which was applied to refine and screen the database. Figure S1 presents the flow chart illustrating the selection process and the final set of studies included in the dataset.

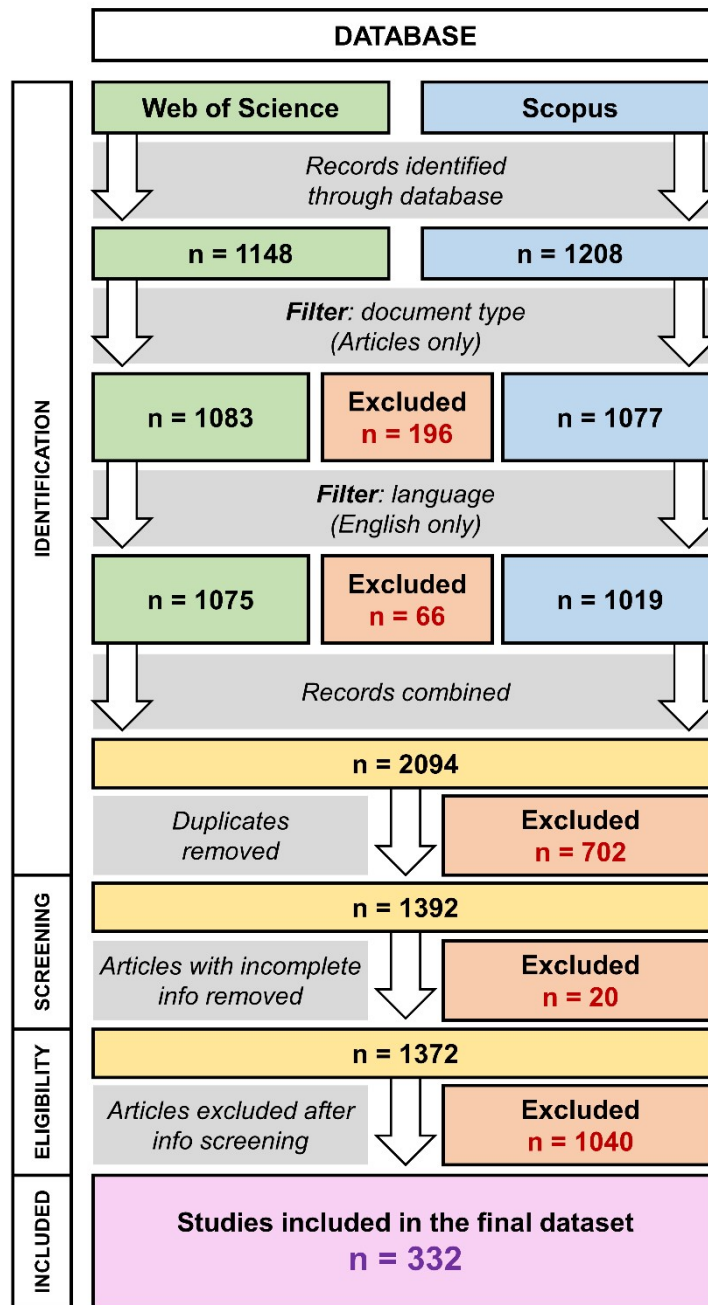


Figure S1. PRISMA 2020 flow diagram summarizing the identification, screening, eligibility assessment, and inclusion of studies retrieved from the Web of Science and Scopus databases (1995 – 2025) for the construction of the final dataset (n = 332).

From the final dataset (n = 332), the database was used as the input for analysis in Bibliometrix/Biblioshiny. Table S2-S5 present the general descriptive information and core characteristics of the studies included in the scientometric evaluation.

Table S2. Summary of descriptive bibliometric indicators, including publication trends, authorship patterns, and collaboration metrics (1995-2005).

Description	Parameter	Results
Main information about data	Timespan	1995 : 2025
	Sources	143
	Documents (doc)	332
	Annual Growth Rate (%)	9.2
	Document Average Age	6.9
	Average Citations per doc	56.39
Documents contents	Keywords plus (ID)	1594
	Author's Keywords (DE)	844
Authors	Authors	1325
	Authors of single-authored docs	6
Authors collaboration	Single-authored docs	6
	Co-authors per doc	5.38
	International co-authorship (%)	15.41

Table S3. Country-level scientific output in the final dataset.

#	Country	Freq.	#	Country	Freq.	#	Country	Freq.
1°	China	390	17°	Indonesia	10	33°	Greece	3
2°	Iran	185	18°	Brazil	9	34°	Philippines	3
3°	India	61	19°	France	9	35°	Sri Lanka	3
4°	South Korea	49	20°	Kazakhstan	9	36°	Argentina	2
5°	USA	42	21°	Malaysia	9	37°	Cyprus	2
6°	Portugal	37	22°	Pakistan	9	38°	Ecuador	2
7°	Egypt	30	23°	Chile	7	39°	Finland	2
8°	Spain	21	24°	Germany	7	40°	Jordan	2
9°	Saudi Arabia	20	25°	UK	6	41°	Oman	2
10°	Mexico	18	26°	Algeria	5	42°	Slovakia	2
11°	Australia	17	27°	Belgium	5	43°	Turkey	2
12°	Poland	13	28°	Nigeria	5	44°	Ukraine	2
13°	Slovenia	13	29°	South Africa	5	45°	Colombia	1
14°	Thailand	11	30°	Singapore	4	46°	Denmark	1
15°	Canada	10	31°	Sweden	4	47°	Kenya	1
16°	Ethiopia	10	32°	Yemen	4	48°	Morocco	1

Table S4. Annual article production.

Year	Production	Year	Production	Year	Production	Year	Production
1995	1	2003	1	2011	7	2019	24
1996	0	2004	1	2012	11	2020	36
1997	0	2005	0	2013	12	2021	20
1998	0	2006	1	2014	18	2022	28
1999	0	2007	3	2015	21	2023	23
2000	1	2008	3	2016	25	2024	25
2001	0	2009	3	2017	18	2025	14
2002	0	2010	6	2018	29		

Table S5. Lotka's Law and cumulative distribution.

Documents written	N. of Authors	Proportion of Authors	Cumulative	Theoretical
1	1087	0.819	0.819	0.644
2	146	0.110	0.929	0.161
3	42	0.032	0.961	0.072
4	17	0.013	0.974	0.040
5	15	0.011	0.985	0.026
6	6	0.005	0.990	0.018
7	8	0.006	0.996	0.013
8	1	0.001	0.997	0.010
10	1	0.001	0.998	0.006
11	1	0.001	0.999	0.005
12	1	0.001	1.000	0.004