Supplementary File S1. Database searches, record flow and other sources

Manuscript: Silicon Nitride Coatings on Dental and Orthopedic Implants: A Systematic Review of Preclinical Studies (manuscript jfb-4640270). **Version 2 (corrected 3 November 2026); it replaces the version uploaded on 30 October 2026.** Changes: a drafting note was removed, Section 4 was completed, the total in the first table was corrected (485 in the first searches, 807 with the later searches), the wording of Sections 3 and 6 was corrected, and the document is no longer highlighted.

The first five database searches were run on 3 October 2026 with no language or date limits; the later searches are dated in sections 2b to 2d and in section 5. The search files are deposited in the OSF project (https://osf.io/n2ck7).

1. Databases, platforms, fields and records

Database	Platform and interface	Fields and settings	Records
MEDLINE (Ovid)	Ovid MEDLINE(R) ALL 2026 through Journals@Ovid (the MEDLINE [Ovid] interface returned an access error); the search was reproduced in PubMed, see section 2b	Title, abstract and keyword fields; line 4 (combination)	29
Embase	Embase.com	Title, abstract and keyword fields; automatic mapping disabled; exported as RIS	27
Scopus	Scopus	TITLE-ABS-KEY	192
Web of Science	Core Collection	Topic (TS)	237
Cochrane CENTRAL	Cochrane Library (trials only)	Search lines 1 to 4; no records exported because the combined search found none	0
MEDLINE via ProQuest	ProQuest MEDLINE	Strategy S2 to S14 in section 2c; exported as RIS with abstracts	275 retrieved (25 October 2026); 48 exported
Total			485 in the first searches; 807 with the later searches (section 3)

2. Strings as run

Embase.com. ('silicon nitride':ti,ab,kw OR 'si3n4':ti,ab,kw OR 'sinx':ti,ab,kw) AND (coating:ti,ab,kw OR coated:ti,ab,kw OR 'surface modification':ti,ab,kw OR sputtering:ti,ab,kw OR hipims:ti,ab,kw OR 'laser cladding':ti,ab,kw OR pvd:ti,ab,kw OR cvd:ti,ab,kw) AND (implant:ti,ab,kw OR 'dental implant':ti,ab,kw OR osseointegration:ti,ab,kw OR arthroplasty:ti,ab,kw OR prosthesis:ti,ab,kw)

Scopus. TITLE-ABS-KEY("silicon nitride" OR "Si3N4" OR "SiNx") AND TITLE-ABS-KEY(coating OR coated OR "surface modification" OR sputtering OR HiPIMS OR "laser cladding") AND TITLE-ABS-KEY(implant OR "dental

implant" OR osseointegration OR arthroplasty OR prosthesis)

Web of Science. TS=("silicon nitride" OR "Si3N4" OR "SiNx") AND TS=(coating OR coated OR "surface modification" OR sputtering OR HiPIMS OR "laser cladding") AND TS=(implant OR "dental implant" OR osseointegration OR arthroplasty OR prosthesis)

Cochrane CENTRAL. ("silicon nitride" OR "Si3N4" OR "SiNx") AND (coating OR coated) AND (implant OR arthroplasty OR "dental implant"). Search 1 returned 13 records, search 2 returned 39,442, search 3 returned 47,573, and the combination (search 4) returned 0.

Ovid MEDLINE. Three concept blocks (silicon nitride terms; coating terms; implant terms) were combined with AND as line 4, which returned 29 records. The original line-by-line search history was not retained. Reconstruction (not the original input): 1. ("silicon nitride" or "Si3N4" or "SiNx").ti,ab,kf. 2. (coating or coated or "surface modification" or sputtering or HiPIMS or "laser cladding" or PVD or CVD).ti,ab,kf. 3. (implant or "dental implant" or osseointegration or arthroplasty or prosthesis).ti,ab,kf. 4. 1 and 2 and 3

2b. Reproduction of the MEDLINE search and the broader PubMed search

Ovid re-run attempt. A later attempt to re-run the search in Ovid exported records labeled Journals@Ovid Full Text, which is a different database from Ovid MEDLINE. The two exports contained 16 and 17 records; 5 (or 6) were already among the 328 records and 11 were new. The 11 new records were non-biomedical or not studies of a silicon nitride coating on an implant, except one study of silicon nitride films for silicon-based biosensors that is probably not eligible; none was included. This re-run was not used as the MEDLINE search.

PubMed reproduction (Search 1, 29 records). The MEDLINE search was reproduced in PubMed (27 October 2026, 01:21) with this string: ("silicon nitride"[tiab] OR Si3N4[tiab] OR SiNx[tiab]) AND (coating[tiab] OR coated[tiab] OR "surface modification"[tiab] OR sputtering[tiab] OR HiPIMS[tiab] OR "laser cladding"[tiab] OR PVD[tiab] OR CVD[tiab]) AND (implant[tiab] OR "dental implant"[tiab] OR osseointegration[tiab] OR arthroplasty[tiab] OR prosthesis[tiab]) No filters or limits were applied. The 29 records are the same 29 records returned by the Ovid MEDLINE search on 3 October 2026 (all already among the 328 records; none new). The PubMed search details (translated query) were exported from the search history.

Broader PubMed search (Search 2, 81 records, run by the second reviewer). Run on 27 October 2026 (01:23) using this string: ("silicon nitride"[tiab] OR Si3N4[tiab] OR SiNx[tiab] OR "silicon carbon nitride"[tiab] OR SiCN[tiab]) AND (coating*[tiab] OR coated[tiab] OR "thin film*"[tiab] OR nanofilm*[tiab] OR "surface layer*"[tiab] OR "surface modification"[tiab] OR sputter*[tiab] OR HiPIMS[tiab] OR "laser cladding"[tiab] OR "laser sinter*"[tiab] OR "electrophoretic deposition"[tiab] OR "melt bond*"[tiab] OR "micro-arc oxidation"[tiab] OR PVD[tiab] OR CVD[tiab] OR PECVD[tiab]) AND (implant*[tiab] OR osseointegration[tiab] OR arthroplast*[tiab] OR prosthe*[tiab] OR "joint replacement*"[tiab] OR orthop*[tiab] OR dental[tiab] OR PEEK[tiab] OR PEKK[tiab]) No filters or limits were applied. It returned 81 records, which include the 29 above; 65 were already among the 328 records and 16 were new. The 16 new records were screened by the reviewers: 15 were excluded at title and abstract (non-biomedical, 8; different coating material or application, 5; review, 1; not a coating, 1) and one, a SiCN coating on silicon wafers only, was excluded at full text (Supplementary File S3). None was eligible. The PubMed exports contain no abstracts.

2c. ProQuest MEDLINE search

MEDLINE was searched again through ProQuest on 25 October 2026 (the strategy file was generated at 13:18 ProQuest time). The final set (S14) retrieved 275 records, but only 48 could be exported. Of the 48, 9 were already among the records found and the 39 new records (photonics, electronics, titanium nitride films, nanofabrication and microscopy; one study of tantalum oxide nanodots and one of the oxide layer of Ti6Al4V) were excluded at title and abstract; none concerned a silicon nitride coating on an implant. The other 227 records could not be exported and were not screened (a limitation); the strategy was therefore re-run in PubMed (section 2d). Strategy

as generated by ProQuest on 25 October 2026 (database: MEDLINE; no limits recorded in the strategy file):

Set	Searched for	Results
S2	silicon nitride,nm (substance name)	1,253
S6	(coat* OR film* OR layer* OR deposit* OR cladding)	1,417,654
S7	Coated Materials, Biocompatible/ (MeSH)	23,082
S8	(implant* or prosthe* or arthroplast* or joint replacement* or titanium or cobalt chromium or CoCr or PEEK or PEKK or polyetheretherketone or orthop?edic* or dental)	1,857,073
S9	exp Prostheses and Implants/ or exp Dental Implants/ or exp Titanium/ (MeSH)	1,531
S10	(silicon nitride or Si3N4 or "SiNx" or silicon carbon nitride or silicon carbonitride or "SiCN")	5,729
S11	[S2] OR [S10]	5,729
S12	[S6] OR [S7]	1,417,654
S13	[S8] OR [S9]	1,857,073
S14	[S11] AND [S12] AND [S13]	275

2d. PubMed re-run of the ProQuest strategy

Because only 48 of the 275 ProQuest records could be exported, the strategy was re-run in PubMed on 25 October 2026 (16:51) with this string (confirmed by the authors as the string run): ("silicon nitride"[tiab] OR Si3N4[tiab] OR SiNx[tiab] OR "silicon carbon nitride"[tiab] OR silicon carbonitride[tiab] OR SiCN[tiab] OR "silicon nitride"[nm]) AND (coat*[tiab] OR film*[tiab] OR layer*[tiab] OR deposit*[tiab] OR cladding[tiab] OR "Coated Materials, Biocompatible"[mh]) AND (implant*[tiab] OR prosthe*[tiab] OR arthroplast*[tiab] OR "joint replacement*"[tiab] OR titanium[tiab] OR "cobalt chromium"[tiab] OR CoCr[tiab] OR PEEK[tiab] OR PEKK[tiab] OR polyetheretherketone[tiab] OR orthop*[tiab] OR dental[tiab] OR "Prostheses and Implants"[mh] OR "Dental Implants"[mh] OR titanium[mh]) No filters or limits were applied. It returned 193 records, which include the 29 records of the first PubMed search and 78 of the 81 of the second reviewer's broader search, and 23 of the 48 exported ProQuest records, so it is a search of its own and not an exact reproduction of the ProQuest search. One hundred records were already among the records found and 93 were new. The reviewers excluded all 93 at title and abstract: 42 as non-biomedical, 42 for a different coating material or an application outside dental and orthopedic implants, 8 as not a coating (bulk silicon nitride, composites, clinical cage studies) and 1 as a review. Three borderline records were decided after reading their abstracts: SiCN layers on Ni-Cr alloys for dental prosthetics (the substrate is a dental restorative alloy and not an implant material), a review of silicon nitride coatings on titanium for cardiovascular devices, and a study of bulk silicon nitride compared with titanium and PEEK.

3. Record flow

485 records were identified in the first database searches (MEDLINE via Ovid 29, Embase 27, Scopus 192, Web of Science 237, Cochrane CENTRAL 0), 81 in the expanded PubMed search (27 October 2026), 48 exported records of the 275 retrieved in the MEDLINE search through ProQuest (25 October 2026) and 193 in the PubMed re-run of the ProQuest strategy (25 October 2026), 807 in all; 331 duplicates were removed by DOI and title matching, leaving 476 records. Two reviewers screened all 476 records independently (agreement 98.7%, Cohen's kappa 0.94). Fourteen records on which the reviewers disagreed, or were both unsure about a record the first pass had excluded, were decided by a third reviewer: 10 were excluded and 4 were sent to full text. In all, 423 records were excluded at title and abstract (non-biomedical, 213; different coating material or application, 109;

review, overview, book chapter or commentary, 50; not a coating, 51) and 53 reports were carried forward for full-text assessment; 52 were assessed (41 included and 11 excluded) and 1 could not be retrieved (Černý and Van Den Berg 1997). Of the four records the arbiter sent to full text, three were included and one (a polymer-derived SiCNO coating) was excluded. Eight further reports were identified by reference-list scanning, web searches and papers supplied by the authors, and all were assessed: 3 were included (laser cladding on polyethylene, a study of HiPIMS process parameters and a hot-pressed PEEK surface with silicon nitride) and 5 were excluded. In all, 44 studies are included, of which 41 were retrieved by the database and register searches. Trial registries returned 3 records and WHO ICTRP 3 records; none was relevant.

4. Other sources

Backward citation searching only. The reference lists of the retrieved full texts were scanned and targeted searches of PubMed and publisher sites were made; together they found 3 of the 44 included studies (laser cladding on polyethylene, a study of HiPIMS process parameters and a hot-pressed PEEK surface with silicon nitride) and 5 reports that were excluded. Forward citation searching was not performed.

5. Trial registry searches

A record was counted as relevant only if it studied a silicon nitride-coated dental or orthopedic implant. Exports and screenshots of each search are deposited in the OSF project.

Registry	Date searched	Terms	Records	Relevant	Notes
ClinicalTrials.gov	22 Oct 2026	silicon nitride	2	0	NCT01511445 and NCT01557829: bulk spinal cages
ISRCTN (UK)	22 Oct 2026	silicon nitride	0	0	
ChiCTR (China)	22 Oct 2026	氮化硅; dental implant	0; 39	0	39 hits for "dental implant"
OMON (Netherlands)	22 Oct 2026	silicon nitride	1	0	NL-OMON36245 = SNAP, duplicate
CRIS (Korea)	22 Oct 2026	silicon nitride; Si3N4	0	0	
ReBEC (Brazil)	22 Oct 2026	silicon nitride; nitreto de silício	0	0	
IRCT (Iran)	22 Oct 2026	silicon nitride; Si3N4; Persian term	0	0	
WHO ICTRP	24 Oct 2026	silicon nitride; Si3N4; SiNx; silicon carbon nitride; SiCN	2; 0; 1; 0; 0	0	SNAP trial (duplicate); titanium nitride-coated crowns (CTRI/2025/08/093216); unrelated nasal spray trial

In ClinicalTrials.gov, ISRCTN and OMON only the term "silicon nitride" was used. The zero-record result in Cochrane CENTRAL is not evidence that no trial is registered, because CENTRAL is a database of trials and not a registry.

6. Search development, sensitivity and expansion

The terms were chosen from the vocabulary of the studies of silicon nitride coatings known to the authors. As a

retrospective check, 41 of the 44 included studies were retrieved by this strategy. The strategy requires an implant-related term, so studies that describe a coating without one may be missed. An expanded strategy (wildcard forms; further coating and deposition terms such as thin film, nanofilm, surface layer, electrophoretic deposition, laser sintering, melt bonding, micro-arc oxidation and PECVD; broader implant terms) was run in PubMed only, on 27 October 2026: 81 records, 65 already among the 328 and 16 new. The 16 new records were screened by the reviewers: 15 were excluded at title and abstract (non-biomedical, 8; different coating material or application, 5; review, 1; not a coating, 1) and one, a SiCN coating on silicon wafers only, was excluded at full text (Supplementary File S3). None was eligible. It was not repeated in Embase, Scopus, Web of Science or Cochrane CENTRAL because of time.

7. Known precision problem

The term "implant" also retrieves ion-implantation literature from semiconductor and materials engineering, especially in Web of Science. These records were removed at screening.