**Current situation and future perspectives for the use of fungi in the biomaterial industry and proposal for a new classification of fungal-derived materials**

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**Supplementary Material**

**Table S1:** Search strategies and keywords selected for the screening of information that indicates related studies to bio-based materials.

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| **Search 1** | |
| **Database** | **Keywords** |
| PubMed | (((Mycocomposite [Title/Abstract]) OR (Mycelium based composites [Title/Abstract]) OR (Composite foam mycelia[Title/Abstract]) OR (Mycelium-based materials[Title/Abstract]) OR (Fungal mycelium packaging [Title/Abstract]) OR (Myco Foam mushroom-based [Title/Abstract]) OR (Fungal Mycelium-Based Biofoam [Title/Abstract]) OR (Mycelium derived materials[Title/Abstract]) OR (Mycelium composites [Title/Abstract]) OR (Mycelium boards [Title/Abstract]) OR (Composite mycelium material [Title/Abstract]) OR (Mycelium material[Title/Abstract])) AND ((fungi [Title/Abstract]) OR (fungal [Title/Abstract]) OR (fungus [Title/Abstract]) OR (mycelium [Title/Abstract]) OR (mushroom [Title/Abstract]))) |
| Scopus | (TITLE-ABS-KEY("Mycocomposite" OR "Mycelium based composites" OR "Composite foam mycelia" OR "Mycelium-based materials" OR "Fungal mycelium packaging" OR "Myco Foam mushroom-based" OR "Fungal Mycelium-Based Biofoam" OR "Mycelium derived materials" OR "Mycelium composites" OR "Mycelium boards" OR "Composite mycelium material" OR "Mycelium material") AND TITLE-ABS-KEY("fungi" OR "fungal" OR "fungus" OR "mycelium" OR "mushroom")) |
| Web of Science | TS=(("Mycocomposite" OR "Mycelium based composites" OR "Composite foam mycelia" OR "Mycelium-based materials" OR "Fungal mycelium packaging" OR "Myco Foam mushroom-based" OR "Fungal Mycelium-Based Biofoam" OR "Mycelium derived materials" OR "Mycelium composites" OR "Mycelium boards" OR "Composite mycelium material" OR "Mycelium material") AND ("fungi" OR "fungal" OR "fungus" OR "mycelium" OR "mushroom")) |
| **Search 2** | |
| **Database** | **Keywords** |
| PubMed | ((((Mycocomposite [Title/Abstract]) OR (Fungal chitin nanofibers [Title/Abstract]) OR (Fungal chitin nanopapers [Title/Abstract]) OR (Fungal structural polymers [Title/Abstract]) OR (Fungal nanomaterials [Title/Abstract]) OR (fungal chitin nanomaterials [Title/Abstract]) OR (fungal glucan nanomaterials [Title/Abstract]) OR (Natural fungal chitin nanofibrils [Title/Abstract]) OR (Natural fungal chitosan nanofibrils [Title/Abstract])) OR (((Nanopapers [Title/Abstract]) OR (Chitosan glucan nanopapers [Title/Abstract])) AND (common white button mushroom [Title/Abstract]))) AND ((fungi [Title/Abstract]) OR (fungal [Title/Abstract]) OR (fungus [Title/Abstract]) OR (mycelium [Title/Abstract]) OR (mushroom [Title/Abstract]))) |
| Scopus | ((TITLE-ABS-KEY ("Mycocomposite" OR "Fungal chitin nanofibers" OR "Fungal chitin nanopapers" OR "Fungal structural polymers" OR "Fungal nanomaterials" OR "fungal chitin nanomaterials" OR "fungal glucan nanomaterials" OR "Natural fungal chitin nanofibrils" OR "Natural fungal chitosan nanofibrils") OR (TITLE-ABS-KEY ("Nanopapers" OR "Chitosan glucan nanopapers") AND TITLE-ABS-KEY ("common white button mushroom"))) AND TITLE-ABS-KEY ("fungi" OR "fungal" OR "fungus" OR "mycelium" OR "mushroom")) |
| Web of Science | TS=((("Mycocomposite" OR "Fungal chitin nanofibers" OR "Fungal chitin nanopapers" OR "Fungal structural polymers" OR "Fungal nanomaterials" OR "fungal chitin nanomaterials" OR "fungal glucan nanomaterials" OR "Natural fungal chitin nanofibrils" OR "Natural fungal chitosan nanofibrils") OR (("Nanopapers" OR "Chitosan glucan nanopapers") AND "common white button mushroom")) AND ("fungi" OR "fungal" OR "fungus" OR "mycelium" OR "mushroom")) |
| **Search 3** | |
| **Database** | **Keywords** |
| PubMed | (((Hybrid biocomposites from mycelium [Title/Abstract]) OR (Nanofiber mats, composite from fungal mycelium [Title/Abstract]) OR (Mycelium Hybrid Materials [Title/Abstract]) OR (Mycocel biopolymers [Title/Abstract]) OR (Fungal mycelium-nanocellulose [Title/Abstract])) AND ((fungi[Title/Abstract]) OR (fungal [Title/Abstract]) OR (fungus[Title/Abstract]) OR (mycelium [Title/Abstract]) OR (mushroom [Title/Abstract]))) |
| Scopus | (TITLE-ABS-KEY("Hybrid biocomposites from mycelium" OR "Nanofiber mats, composite from fungal mycelium" OR "Mycelium Hybrid Materials" OR "Mycocel biopolymers" OR "Fungal mycelium-nanocellulose") AND TITLE-ABS-KEY("fungi" OR "fungal" OR "fungus" OR "mycelium" OR "mushroom")) |
| Web of Science | TS=(((Hybrid biocomposites from mycelium) OR (Nanofiber mats, composite from fungal mycelium) OR (Mycelium Hybrid Materials) OR (Mycocel biopolymers) OR (Fungal mycelium-nanocellulose)) AND ((fungi) OR (fungal) OR (fungus) OR (mycelium) OR (mushroom))) |
| **Search 4** | |
| **Database** | **Keywords** |
| PubMed | (((Pure mycelium materials [Title/Abstract]) OR (Fungal skin [Title/Abstract]) OR (Mycelium films [Title/Abstract]) OR (Flexible Fungal Materials [Title/Abstract]) OR (fungal flexible materials [Title/Abstract]) OR (FFMs [Title/Abstract])) AND ((fungi [Title/Abstract]) OR (fungal [Title/Abstract]) OR (fungus [Title/Abstract]) OR (mycelium [Title/Abstract]) OR (mushroom [Title/Abstract]))) |
| Scopus | (TITLE-ABS-KEY ("Pure mycelium materials" OR "Fungal skin" OR "Mycelium films" OR "Flexible Fungal Materials" OR "fungal flexible materials" OR "FFMs") AND TITLE-ABS-KEY ("fungi" OR "fungal" OR "fungus" OR "mycelium" OR "mushroom")) |
| Web of Science | TS=(("Pure mycelium materials" OR "Fungal skin" OR "Mycelium films" OR "Flexible Fungal Materials" OR "fungal flexible materials" OR "FFMs") AND ("fungi" OR "fungal" OR "fungus" OR "mycelium" OR "mushroom")) |

**Table S2:** Inclusion and exclusion criteria for the literature review

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| **Inclusion criteria** | **Description of potential applications** |
| Material application | Structuring in construction, sound or thermal insulation, furniture, packaging, textiles, reinforcing or structuring nanocomposites |
| Origin | Materials strictly derived from filamentous fungi |
| **Exclusion criteria** |  |
| Material application | Medical, food, nutraceutical or bioceutical applications |
| Origin | Materials derived from Bacteria, yeast or symbiotic culture of bacteria and yeast (SCOBY), or any of these in interactions with filamentous fungi |

**Table S3:** Wood-colonizing fungi that are able to produce Laccase enzymes used to reconstruct a phylogeny based on internal transcriber spacer.

**Table S4:** Other names used to describe mycocomposites, hybrid materials, and fungal chitin nanofibers in literature

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| --- | --- | --- |
| **Type of biomaterial** | **Synonyms** | **Reference** |
| Mycocomposites | Mycelium-based composites | (Appels et al., 2019) |
| Composite foam mycelia | (Arifin & Yusuf, 2013) |
| Mycelium-based materials | (Lelivelt et al., 2015; Karana et al., 2018) |
| Fungal mycelium packaging | (Holt et al., 2012) |
| MycoFoam mushroom-based | (Macarthur, Waughray & Stuchtey, 2006) |
| Fungal Mycelium-Based Biofoam | (Yang et al., 2017) |
| Mycelium-derived materials | (Jones et al., 2020; Appels et al., 2020) |
| Mycelium composites | (Jones et al., 2020) |
| Mycelium boards | (Vasquez & Vega, 2019) |
| Composite mycelium material | (Appels et al., 2020) |
| Mycelium material | (Appels et al., 2020) |
| Hybrid Materials | Hybrid biocomposites from mycelium | (Attias et al., 2021) |
| Mycelium–nanocellulose biocomposite | (Attias et al., 2021) |
| Hybrid NC–mycelium biocomposites | (Attias et al., 2021) |
| Nanofiber mats, composite from fungal mycelium | (Sabantina et al., 2019) |
| Bio-based composites | (Sabantina et al., 2019) |
| PAN/mycelium composites | (Sabantina et al., 2019) |
| Mycelium Hybrid Materials | (Attias et al., 2021) |
| Mycocel biopolymers | (Irbe et al., 2021) |
| Fungal mycelium–nanocellulose | (Irbe et al., 2021) |
| Mycelium-reinforced nanocomposities | (Trabelsi et al., 2021) |
| Mycelium/PAN composites | (Trabelsi et al., 2021) |
| Mycelium-enhanced nanocomposites | (Trabelsi et al., 2021) |
| Bio-mycelium composites | (Trabelsi et al., 2021) |
| Mycelium-reinforced biocomposities | (Trabelsi et al., 2021) |
| Hybrid panel composites | (Sun et al., 2019) |
| Hybrid systems of wood, mycelium and CNF | (Sun et al., 2019) |
| HNT-fungus hybrids | (Ahn et al., 2020) |
| HNT-doped fungal mycelia hybrid | (Ahn et al., 2020) |
| Mycelium/BT hybrid materials | (Li et al., 2016) |
| Hybrid biological material | (Li et al., 2016) |
| Hybridisation of mycelium composites | (Elsacker et al., 2021) |
| Hybrid materials | (Elsacker et al., 2021) |
| Hybridisation of mycelium materials | (Elsacker et al., 2021) |
| Hybridization of mycelium materials | (Elsacker, De Laet & Peeters, 2022) |
| Fungal Chitin Nanofibers | Fungal microfilaments | (Jones et al., 2018) |
| Fungal biopolymers and the fungal biorefinery | (Jones et al., 2020) |
| Fungal chitin | (Janesch et al., 2019; Nawawi et al., 2020a) |
| Nanomaterials Derived from Fungal Sources | (Nawawi et al., 2020a, 2020b) |
| Chitin nanofibers from fungal | (Nawawi et al., 2020a) |
| Chitin nanopapers from a fungal | (Nawawi et al., 2020a) |
| Nanopapers derived from common white-button mushroom | (Nawawi et al., 2020b) |
| Chitosan-glucan nanopapers derived from common white button mushroom | (Nawawi et al., 2020b) |
| Fungal chitin nanofibers | (Janesch et al., 2019) |
| Fungal structural polymers | (Nawawi et al., 2020b) |
| Fungal nanomaterials | (Nawawi et al., 2020b) |
| Chitin/ glucan nanomaterials | (Appels et al., 2020) |
| Natural nanofibrils (chitin and chitosan), | (Jones et al., 2018) |
| Fungal chitin-glucan nanopapers | (Yousefi et al., 2021) |
| FChNF. Nanopapers | (Yousefi et al., 2021) |
| Nanofibers obtained from mushrooms | (Zin, Jimat & Nawawi, 2022) |
| Chitin Nanofibers (ChNF) | (Salehinik et al., 2021) |
| (FChNF) Fungal Chitin Nanofibers | (Nawawi et al., 2020b) |
| Chitinous materials and nanofibers derived from fungal mycelium | (Jones et al., 2018) |
| Chitinous composites and nanofibers | (Jones et al., 2018) |

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