

Supporting Information

Biomass-Derived Carbon for Electrode Fabrication in Microbial Fuel Cells: A Review

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Author Contributions

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Table S1 Summary of biomass-derived carbon anodes in MFCs reported in recent literature

Anode precursor	Preparation process	Type of MFC	Inoculation	Substrate	Maximum power output	References
Bamboo	Carbonization	Two-chamber	Preacclimated bacteria from an active MFC	Acetate	$1652 \pm 18 \text{ mW/m}^2$	¹
Pinecone	Carbonization	Two-chamber	Preacclimated bacteria from an active MFC	Acetate	10.88 W/m^3	²
Sewage sludge	Methane chemical vapor	Two-chamber	Preacclimated bacteria from an active MFC	Acetate	2228 mW/m^2	³
Cake	Carbonization and polymerization	Single-chamber	Preacclimated bacteria from an active MFC	Acetate	1307 mW/m^2	⁴
Bread	Carbonization	Two-chamber	Preacclimated bacteria from activated anaerobic sludge	Acetate	134 mW/m^2	⁵
Pomelo peel	Carbonization	—	Domestic wastewater	Acetate	4.0 mA/cm^2	⁶
Neem wood	Carbonization	Two-chamber	Preacclimated bacteria from an active MFC	Glucose	$256 \pm 25 \text{ mW/m}^2$	⁷
Cocklebur fruit	Carbonization	Single-chamber	Preacclimated bacteria from an active MFC	Acetate	$572.57 \pm 24.90 \mu\text{W}$	⁸
Silk cocoon	Carbonization	Single-chamber	Preacclimated bacteria from activated anaerobic sludge	Acetate	$\sim 5.0 \text{ mW/g}$	⁹
Loofah Sponge	Polymerization and carbonization	Single-chamber	Preacclimated bacteria from an active MFC	Acetate	$1090 \pm 72 \text{ mW/m}^2$	¹⁰
Municipal sludge	Carbonization and	Two-	<i>Shewanella oneidensis</i> MR-1	Lactate	568.5 mW/m^2	¹¹

	polymerization	chamber					
Cotton textile	Carbonization and polymerization	Single-chamber	Preacclimated bacteria from an active MFC	Acetate	$931 \pm 61 \text{ mW/m}^2$	12	
kapok fibers	Carbonization	Single-chamber	Preacclimated bacteria from anaerobic sludge	Acetate	1738.1 mW/m^2	13	
King mushroom	Carbonization	—	Anaerobic digester of a sewage treatment plant	Acetate	2.09 mA/cm^2	14	
Wild mushroom	Carbonization	—	Anaerobic digester of a sewage treatment plant	Acetate	3.02 mA/cm^2	14	
Corn stem	Carbonization	—	Anaerobic digester of a sewage treatment plant	Acetate	3.12 mA/cm^2	14	
Sewage sludge	Carbonization	Two-chamber	—	Acetate	3.2 W/m^2	15	
Sugarcane	Carbonization	Two-chamber	Preacclimated bacteria from an active MFC	Acetate	$59.94 \pm 2.81 \text{ W/m}^3$	16	
Sewage sludge/coconut shell	Carbonization	Single-chamber	Preacclimated bacteria from an active MFC	Acetate	$1069 \pm 15 \text{ mW/m}^2$	17	
Loofah sponges	Chinese ink-coating	Single-chamber	Preacclimated bacteria from an active MFC	Acetate	0.82 mW/cm^3	18	
Loofah sponge	Carbon black-coating	Two-chamber	Preacclimated bacteria from an active MFC	Acetate	$61.7 \pm 0.6 \text{ W/m}^3$	19	
Chestnut shell	Carbonization and activation	Single-chamber	Municipal wastewater	Acetate	23.6 W/m^3	20	
kenaf	Carbonization	—	Primary domestic wastewater	Acetate	32.5 A/m^2	21	
Chestnut shell	Carbonization and activation	Single-chamber	Preacclimated bacteria from an active MFC	Acetate	$759 \pm 38 \text{ mW/m}^2$	22	

Table S2 Summary of biomass-derived ORR catalysts in MFCs in recent literature

Cathode precursor	Preparation procedure	Type of MFC	Support substrate	Catalyst loading	Maximum power output	References
Cornstalk	Hydrothermal and carbonization	Single-chamber	SSM	—	1122 ± 32 mW/m ²	²³
Corncob	Carbonization	Single-chamber	Carbon cloth	0.5 mg cm ⁻³	458.85 mW/m ²	²⁴
Sugarcane refuse	Activation and carbonization	Two-chamber	SSM	—	120 ± 15 mW/m ²	²⁵
Green foxtail	Carbonization	Single-chamber	SSM	10 mg cm ⁻²	665 mW/m ²	²⁶
Cornstalk	Carbonization	Single-chamber	SSM	—	1003 mW/m ²	²⁷
Pectin	Carbonization and template method	Single-chamber	SSM	—	1161.13 mW/m ²	²⁸
Dandelion seed	Activation and carbonization	Single-chamber	Carbon cloth	2 mg cm ⁻²	975 ± 46 mW/m ²	²⁹
Bamboo	Carbonization	Single-chamber	SSM	50 mg cm ⁻²	1056 ±38 mW/m ² (1719 ±82 mW/m ²)	³⁰
Egg	Carbonization	Single-chamber	Carbon cloth	0.5 mg cm ⁻³	737.1 mW/m ²	³¹
Alfalfa Leaf	Carbonization and activation	Single-chamber	Carbon cloth	—	1328.9 mW/m ²	³²
Chlorella pyrenoidosa	Carbonization	Single-	SSM	10 mg cm ⁻²	2068 ± 30 mW/m ²	³³

		chamber					
Kraft paper	Carbonization	Single-chamber	—	1 mg cm ⁻²	830 ± 15 mW/m ²	34	
Bamboo tube	Carbonization	Single-chamber	—	80 mg cm ⁻²	40.4 ± 1.5 W/m ³	35	
Cocoon silk	Carbonization and activation	Single-chamber	Carbon cloth	2 mg cm ⁻²	800 mW/m ²	36	
Spider silk	Carbonization and activation	Single-chamber	—	2 mg cm ⁻²	1800 ± 82 mW/m ²	37	
Livestock sewage sludge	Carbonization and activation	Single-chamber	Carbon cloth	—	1273 ± 3 mW/m ²	38	
Plant moss	Hydrothermal and carbonization	Single-chamber	—	2 mg cm ⁻²	703 ± 16 mW/m ²	39	
Bananas	Hydrothermal and carbonization	Single-chamber	Carbon cloth	—	528.2 mW/m ²	40	
chitin	Hydrothermal, carbonization and activation	Single-chamber	Carbon cloth	~7 mg cm ⁻²	705 ± 5 mW/m ²	41	
Watermelon rind	Carbonization	Single-chamber	Carbon cloth	0.5 mg cm ⁻²	0.262 W/m ³	42	
Onion	Carbonization and activation	Single-chamber	Carbon cloth	~7 mg cm ⁻²	742 ± 17 mW/m ²	43	
Glucose	Hydrothermal and carbonization	Single-chamber	SSM	20 mg cm ⁻²	967 ± 34 mW/m ²	44	
Lotus leaves	Hydrothermal and carbonization	Single-chamber	—	—	511.5 ± 25.6 mW/m ²	45	
Sewage sludge	Carbonization	Single-	Carbon cloth	5 mg cm ⁻²	500 ± 17 mW/m ²	46	

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