Recently Published Biochar–related Resources (Feb 2018)

AN ADDENDUM TO THE IBI NEWSLETTER DELIVERED DIRECTLY TO MEMBERS

Papers in this list are from last month's new 'biochar' entries in Google Scholar. Quotes are from the papers, which are accessible through the links provided. These have been extracted by IBI Newsletter Editor Robert W. Gillett to keep the length of this addendum manageable, yet informative enough to prompt further investigation by readers. Emphasis was placed on highlighting new findings leading to practical application, but with the expectation that decisions will be informed by accessing the full publication.

Indawan, E, SU Lestari, N Thiasari - Journal of Degraded and Mining, 2018. "**Sweet Potato** Response to Biochar Application on Sub-Optimal Dry Land." *Neliti.com*. https://www.neliti.com/publications/222803/sweet-potato-response-to-biochar-application-on-sub-optimal-dry-land.

From the Abstract: "The use of 5 t biochar /ha increased storage root yields that ranged from 8 to 45%."

Knox, OGG, HJ Weitz, P Anderson - … Technology & Innovation, 2018. "Improved Screening of Biochar Compounds for **Potential Toxic Activity** with Microbial Biosensors." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S2352186417301153.

From the Abstract: "We set out to establish what the environmental hazards might be for a range of softwood biochars. To facilitate this we conducted biochar headspace analysis, plant germination and bacterial biosensor assays."

Ni, N, F Wang, Y Song, Y Bian, R Shi, X Yang, C Gu - Chemosphere, 2018. "Mechanisms of Biochar Reducing the **Bioaccumulation of PAHs in Rice** from Soil: Degradation Stimulation vs Immobilization." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0045653517321707.

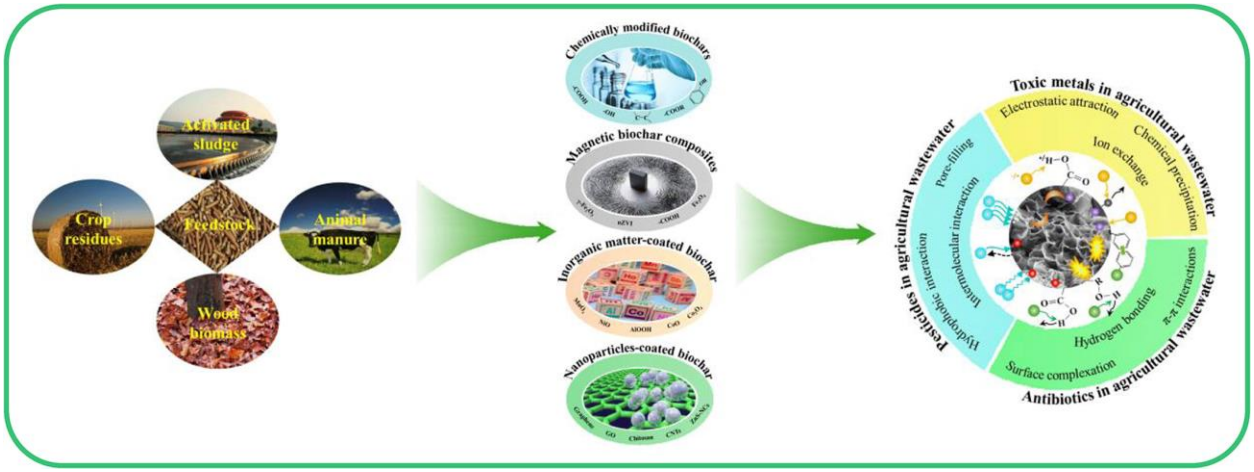
Highlight: "Corn straw or bamboo biochar limited PAH migration from flooded soils into rice."

Cabeza, I, T Waterhouse, S Sohi, JA Rooke - Animal Feed Science and, 2018. "Effect of Biochar Produced from Different Biomass Sources and at Different Process Temperatures on **Methane Production and Ammonia Concentrations** in Vitro." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0377840117312798.

From the Abstract: "…including biochar in livestock feed could be a practical means of applying biochar to pasture and soil."

Wei, D, B Li, H Huang, L Luo, J Zhang, Y Yang, J Guo - Chemosphere, 2018. "**Biochar-Based Functional Materials in the Purification of Agricultural Wastewater**: Fabrication, Application and Future Research Needs." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0045653517321719.

From the Abstract: "The focus of this review is to highlight the fabrication methods and application of biochar-based functional materials with the removal of different agricultural contaminants, and discuss the underlying mechanisms."



Weber, K, P Quicker - Fuel, 2018. "**Properties of Biochar**." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0016236117316216.

From the Abstract: "The data evaluation has shown that among all process conditions, the treatment temperature has by far the most dominant influence on all properties. Especially the rather narrow temperature range between 200 and 400 °C causes the most significant changes and is therefore very sensible to influences and possibly difficult to control."

Liu, Z, X Cheng, D Sun, J Meng, W Chen - Chilean journal of, 2017. "Maize Stover Biochar Increases Urea (15 N Isotope) Retention in Soils but Does Not Promote Its Acquisition by x Plants during a **4-Year Pot Experiment**." *SciELO Chile*. http://www.scielo.cl/scielo.php?pid=S0718-58392017000400382&script=sci_arttext.

From the Abstract: "Results showed that biochar only increased maize biomass (about 9%) with high amount of urea addition, which indicates the increased maize dry weight by biochar application could be attributed to synergistic effects between biochar and urea."

Weidemann, E, W Buss, M Edo, … O Mašek - … Science and Pollution, 2018. "Of Pyrolysis Temperature and Production Unit on Formation of Selected **PAHs, Oxy-PAHs, N-PACs, PCDDs, and PCDFs in Biochar**—a Screening Study." *Springer*. https://link.springer.com/article/10.1007/s11356-017-0804-6.

From the Abstract: "The results revealed that the type of biomass had a significant influence on the PAH, oxy-PAH, and N-PAC content of the biochars. The configuration and type of the pyrolysis unit influenced only the wheat straw pyrolyzed at 550 °C."

Baek, G, J Kim, J Kim, C Lee - Energies, 2018. "Role and Potential of Direct Interspecies Electron Transfer in **Anaerobic Digestion**." *Mdpi.com*. http://www.mdpi.com/1996-1073/11/1/107.

From the Abstract: "Recent studies have shown that conductive materials (e.g., iron oxides, activated carbon, biochar, and carbon fibers) can mediate direct electrical connections for [direct interspecies electron transfer]. Microorganisms attach to conductive materials' surfaces or vice versa according to particle size, and form conductive biofilms or aggregates."

Muter, O, L Grantina-Ievina, and G Makarenkova. "Effect of **Biochar and Trichoderma** Application on Fungal Diversity and Growth of Zea Mays in a Sandy Loam Soil." *Eeb.lu.lv*. http://eeb.lu.lv/EEB/current/EEB_XV_Muter.pdf.

From the Abstract: "Addition of straw-derived BC with immobilized [*Trichoderma viride*] to sandy loam soil promoted survival of Trichoderma spp. and significantly ($p < 0.05$) increased maize growth."

Seitz, T, and D Solomon. 2017. "Report 2: Synopsis and Evaluation of Biochar Activities in **Ethiopia**-Schemes for Potential Biochar Systems." https://ecommons.cornell.edu/handle/1813/55324.

From the Abstract: "…research activities have identified promising feedstock sources to produce biochar, such as, coffee husks, *Prosopis juliflora*, or animal bones. But none of them could present a well-suited technology to convert this biomass to biochar."

Liu, L, Z Tan, Z Ye - ACS Sustainable Chemistry & Engineering, 2018. "Transformation and **Transport Mechanism of Nitrogenous Compounds** in a Biochar 'Preparation-Returning to the Field' process Studied by Employing an Isotope Tracer." *ACS Publications*. http://pubs.acs.org/doi/abs/10.1021/acssuschemeng.7b03172.

From the Abstract: "After returning biochar to soil, the measurable total nitrogen in biochar that migrated to soil and plants displayed a nitrogen mass distribution rate in the order of[:] biochar after returning (88.40–90.42%) > soil (8.81–10.07%) > plants (0.77–1.53%)."

Seitz, T, and D Solomon. 2017. "Potential-Analysis of Biochar Systems for Improved Soil and Nutrient Management in **Ethiopian Agriculture**." https://ecommons.cornell.edu/handle/1813/55322.

From the Abstract: "Particularly in tropical and subtropical Africa, soils are affected by degradation, which has a negative impact on agricultural production. … More efforts must therefore be made to stop the progressive soil degradation and, where possible, to reverse it."

Wang, S, Y Zhou, S Han, N Wang, W Yin, X Yin, B Gao - Chemosphere, 2018. "Carboxymethyl Cellulose Stabilized ZnO/biochar Nanocomposites: Enhanced Adsorption and Inhibited Photocatalytic Degradation of **Methylene Blue**." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0045653518300286.

From the Abstract and Highlights: "Exogenous [Carboxymethyl Cellulose] (2 g L^{-1}) increased [Methylene Blue] sorption from 10.6% to 73.1% ...[Carboxymethyl Cellulose] capping is not suitable for [Methylene Blue] degradation by ZnO"

Wu, J, D Huang, X Liu, J Meng, C Tang, J Xu - Journal of Hazardous, 2018. "Remediation of **As (III) and Cd (II) Co-Contamination** and Its Mechanism in Aqueous Systems by a Novel Calcium-Based Magnetic Biochar." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0304389418300116.

From the Abstract: "[Calcium-based magnetic biochar] ... had a great ability to adsorb arsenic and cadmium within 0.5 h for cadmium and 12 h for arsenic ... with an optimal pH of pH 5."

Lima, IM, M Wright - Cogent Food & Agriculture, 2018. "**Microbial Stability** of Worm Castings and Sugarcane Filter Mud Compost Blended with Biochar." *Cogentoa.com*. https://www.cogentoa.com/article/10.1080/23311932.2018.1423719.

From the Abstract: "No major deleterious effects to the microbial population were found by adding biochar to either substrate, despite decreasing moisture levels for increased biochar additions."

Sara, ZS, T Shah - Open Journal of Soil Science, 2018. "Residual Effect of Biochar on Soil Properties and Yield of **Maize (Zea Mays L.) under Different Cropping Systems**." *Scirp.org*. http://www.scirp.org/journal/PaperInformation.aspx?paperID=81692.

From the Abstract: "...chickpea-maize cropping system performed better in terms of improving yield and yield components of maize and in improving soil properties. ... Thus we recommend that legumes must be involved in cropping system for sustainable and higher productivity and improved soil properties."

Mahdi, Z, QJ Yu, A El Hanandeh - Journal of Environmental Chemical, 2018. "Investigation of the Kinetics and Mechanisms of **Nickel and Copper** Ions Adsorption from Aqueous Solutions by Date Seed Derived Biochar." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S2213343718300216.

From the Abstract: "...optimal adsorption occurred around pH 6 with maximum adsorption capacity of 0.421 and 0.333 mmol g^{-1} for Cu^{2+} and Ni^{2+}, respectively."

Setianingsih, T, M Masruri, B Ismuyanto - The Journal of Pure and, 2018. "**Synthesis of Patchouli Biochar Cr2O3 Composite** Using Double Acid Oxidators for Paracetamol Adsorption." *Jpacr.ub.ac.id*. http://jpacr.ub.ac.id/index.php/jpacr/article/view/367.

Dang, T, P Marschner, R Fitzpatrick, LM Mosley - Water, 2018. "Assessment of the Binding of Protons, **Al and Fe** to Biochar at Different pH Values and Soluble Metal Concentrations." *Mdpi.com*. http://www.mdpi.com/2073-4441/10/1/55.

From the Abstract: "The biochar had a high retention capacity for Al and Fe; at high (>1 mM) concentrations, over 80% of soluble metals were retained."

Manap, NRA, R Shamsudin, … MN Maghpor - Journal of, 2018. "Adsorption Isotherm and Kinetic Study of Gas-Solid System of **Formaldehyde on Oil Palm Mesocarp Bio-Char**:

Pyrolysis Effect." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S2213343717307066.

Boer, MA de, M Hammerton, JC Slootweg - Water Research, 2018. "Uptake of Pharmaceuticals by Sorbent-Amended Struvite Fertilisers Recovered from **Human Urine** and Their Bioaccumulation in Tomato Fruit." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0043135418300198.

From the Abstract: "…biochar and zeolite are coupled with struvite precipitation to increase the N-recovery of struvite from 5.7% to 9.8%."

Meng, J, L Zhong, L Wang, X Liu, … C Tang - … Science and Pollution, 2018. "Contrasting Effects of Alkaline Amendments on the Bioavailability and **Uptake of Cd in Rice** Plants in a Cd-Contaminated Acid Paddy Soil." *Springer*. https://link.springer.com/article/10.1007/s11356-017-1148-y.

From the Abstract: "The amendment of carbide slag decreased Cd concentration in rice grains the most, followed by lime, biochar, and compost."

Tan, G, H Wang, N Xu, H Liu, L Zhai - Environmental Science and Pollution, 2018. "Biochar Amendment with Fertilizers Increases Peanut N Uptake, Alleviates **Soil N2O Emissions** without Affecting NH3 Volatilization in Field." *Springer*. https://link.springer.com/article/10.1007/s11356-017-1116-6.

From the Abstract: "While biochar amendment had no significant effect on soil NH_3 volatilization, it did decrease the cumulative N_2O emission by 36.3% on average with organic fertilizer, and by 32.6% with mineral fertilizer, respectively ($p<0.05$)."

Awad, YM, SS Lee, KH Kim, YS Ok, Y Kuzyakov - Chemosphere, 2018. "Carbon and Nitrogen Mineralization and Enzyme Activities in Soil Aggregate-Size Classes: Effects of Biochar, **Oyster Shells**, and Polymers." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0045653518300420.

From the Abstract: "…the combination of [biochar] … with [oyster shell] was seen to accelerate N turnover without affecting C turnover (and related C losses) from soil. As such, the addition of these additives contributed considerably to the improvement of soil fertility and C sequestration."

III, CL Webber, PM White Jr, … DJ Spaunhorst - Journal of Agricultural, 2018. "Sugarcane Biochar as an Amendment for Greenhouse **Growing Media** for the Production of **Cucurbit** Seedlings." *Ccsenet.org*. http://www.ccsenet.org/journal/index.php/jas/article/view/71875.

From the Abstract: "In respect to seedling production, the biochars … performed well, especially at the 25 and 50% levels for both plant species. … These results indicate that the volume of a standard soilless greenhouse growing media can be successfully extended by adding 25 to 50% sugarcane biochar without a reduction in squash and cantaloupe seedling production."

Liu, Y, J Zhu, C Ye, P Zhu, Q Ba, … J Pang - Science of The Total, 2018. "Effects of Biochar Application on the **Abundance and Community Composition of Denitrifying Bacteria** in

a Reclaimed Soil from Coal Mining Subsidence Area." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0048969718300032.

From the Abstract: "…biochar application to the reclaimed soil in coal mine subsidence area could influence the abundance and diversity of soil denitrifiers and improve soil nutrients thus crop yield."

Furtado, GF, LHG Chaves - Journal of Agricultural Science, 2018. "Growth Rates and **Sunflower** Production in Function of Fertilization with Biochar and NPK." *Ccsenet.org*. http://www.ccsenet.org/journal/index.php/jas/article/view/71871.

From the Abstract: "The combination of 50: 150: 75 mg kg^{-1} of NPK and 400 g/pot of biochar promotes higher production of sunflower (23.91 g/plant)."

Rajapaksha, AU, MS Alam, N Chen, … DS Alessi - Science of The Total, 2018. "Removal of **Hexavalent Chromium** in Aqueous Solutions Using Biochar: Chemical and Spectroscopic Investigations." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0048969717336227.

From the Abstract: "The highest Cr(VI) removal from solution occurred at low pH values (pH 2–5), and adsorption decreased approximately tenfold when the pH increased from 2 to 10. ... approximately 90% of the total Cr(VI) (962 µM) was reduced to Cr(III). ...Trivalent chromium is far less soluble than Cr(VI) and typically precipitates as amorphous Cr(III) solids."

Grutzmacher, P, AP Puga, … MPS Bibar - Science of The Total, 2018. "Carbon Stability and Mitigation of Fertilizer Induced **N2O Emissions** in Soil Amended with Biochar." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0048969717336215.

From the Abstract: "When NH_4NO_3 was co-applied, biochars reduced fertilizer induced N_2O emissions, reaching a seven-fold reduction in [sewage sludge]-biochar treatment. The fertilizer emission factor (EF) decreased with biochar amendments as well, varying between 0.01 and 0.08% of the fertilizer N emitted as N_2O..."

Pokharel, P, JH Kwak, YS Ok, SX Chang - Science of The Total Environment, 2018. "Pine Sawdust Biochar Reduces **GHG Emission** by Decreasing Microbial and Enzyme Activities in Forest and Grassland Soils in a Laboratory Experiment." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0048969717337762.

Highlights: "[550 °C Biochar] reduced cumulative CO_2 emission from forest soil in laboratory condition. ... [550 °C Biochar] and [Steam-activated 550 °C Biochar] reduced cumulative N_2O emission from forest and grassland soils."

Korai, PK, X Xia, X Liu, R Bian, MO Omondi - Scientific reports, 2018. "**Extractable Pool of Biochar** Controls on Crop Productivity rather than Greenhouse Gas Emission from a Rice Paddy under Rice-Wheat Rotation." *Nature.com*. https://www.nature.com/articles/s41598-018-19331-z.

From the Paper: "we ... recommend ... biochar [hot water] extraction ... for foliar use for high value vegetables, medicinal plants as well as tea or fruit crops..."

Wang, YY, HY Ji, HH Lu, YX Liu, RQ Yang, LL He - RSC Advances, 2018. "Simultaneous **Removal of Sb (III) and Cd (II)** in Water by Adsorption onto a MnFe2 O4–biochar Nanocomposite." *Pubs.rsc.org*. http://pubs.rsc.org/-/content/articlehtml/2018/ra/c7ra13151h.

From the Abstract: "The maximum Sb(III) removal efficiency was found to be higher from bi-solute solutions containing Cd(II) than from single-solute systems."

Lü, F, K Guo, H Duan, L Shao, PJ He - ACS Sustainable Chemistry, 2018. "Exploit Carbon Materials to Accelerate Initiation and Enhance Process Stability of CO Anaerobic Open-Culture **Fermentation**." *ACS Publications*. http://pubs.acs.org/doi/abs/10.1021/acssuschemeng.7b04589.

From the Abstract: "Compared to the control without carbon material addition, the CO conversion rate increased by up to 149% and 193% and the methane (CH_4) production rate was up to 238% and 186%, respectively, for the biochar and activated carbon scenarios."

Abd-Elrahman, SH. "Effect of Some Organic Amendments on the Availability and Fractions of Certain **Heavy Metals** in Abo Rawash Soil and Growing Wheat Plants." *Researchgate.net*. https://www.researchgate.net/profile/Shaimaa_Abd_Elrahman/publication/321147810.

From the Abstract: "...to evaluate the effect of applying some organic amendments such as humic acid, rabbit manure and biochar on the availability and forms of some heavy metals (i.e. Zn, Cu, Pb and Ni) in contaminated soil... heavy metals concentrations were significantly decreased in wheat plants under irrigation with wastewater, with the highest effect for humic acid treatment."

Giwa, AS, H Xu, J Wu, Y Li, F Chang, … X Zhang - Journal of Cleaner, 2018. "Sustainable Recycling of **Residues from the Food Waste (FW) Composting** Plant via Pyrolysis: Thermal Characterization and Kinetic Studies." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S0959652618301446.

From the Abstract: "...composting residues mainly consisted of lignin (69%), bone (18%) and plastic (12%), with the lower heat value of around 15.72 MJ/kg. The final pyrolysis temperature of over 500 °C was needed for the complete decomposition of the lignin, bone, and plastic components."

Abdulrahman, DK, … RB Othman - Journal of, 2017. "EFFECTS OF BIOCHAR AND **STENOTROPHOMONAS MALTOPHILIA (SB16)** ON SOIL PROPERTIES AND GROWTH OF SWEET CORN." *Search.ebscohost.com*. http://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=03681157&AN=127280357&h=eddkbLTa1CZV0%2B%2FWCai5Hrp2j8Pig9E1Ln8ae1w%2B9%2F3otJ9aA1DvBLHP4iMowTSoSfl2whaI9F6ypHXqm8WVqw%3D%3D&crl=c.

From the Abstract: "Results of laboratory study showed that application of biochar at 0.5 percent without inoculation and 0.25 percent with bacteria Sb16 in both soils significantly increased population of soil bacteria, fungi, actinomycetes and N2-fixing bacteria, enzymes (urease, acid phosphatase and fluorescein diacetate hydrolysis activity), and soil chemical properties (pH, organic C, total N, available P and exchangeable K, Ca and Mg. Glasshouse experiment showed that application of biochar at 5 tons per hectare with bacteria inoculated

significantly (P=0.05) improved growth of corn (shoot and root biomass, root length, root volume, plant height and leaf chlorophyll content)."

Ulrich, BA, M Loehnert, and CP Higgins. Water Research & Technology. "Improved contaminant removal in vegetated **stormwater biofilters** amended with biochar." *Pubs.rsc.org*. http://pubs.rsc.org/-/content/articlepdf/2017/ew/c7ew00070g?page=search.

From the Abstract: "Biochar-amended biofilter columns maintained greater than 99% [trace organic contaminant (TOrC)] removal throughout five months of dosing with TOrC-spiked creek water (equivalent to approximately 1.3 years of runoff volume) ... Further, contaminant removal survey experiments conducted after 6 months of operation revealed that biochar amendment improved removal of total organic carbon, total nitrogen, nitrate, and total dissolved phosphorus in biofilters by greater than 60%."

Tan, G, Y Wu, Y Liu, D Xiao - Journal of the Taiwan Institute of Chemical, 2018. "**Removal of Pb (II)** Ions from Aqueous Solution by Manganese Oxide Coated Rice Straw Biochar A Low-Cost and Highly Effective Sorbent." *Elsevier*. https://www.sciencedirect.com/science/article/pii/S1876107018300063.

Highlights: "MnO_x-coated rice straw biochar was simply synthesized through the direct reaction of $KMnO_4$ with RS biochar under neutral condition. The synthesized RSB/MnO_x composite displayed much higher specific surface area and pore volume compared with the original biochar. RSB/MnO_x showed high sorption capacity to Pb(II) and the q_m was up to 305 mg g^{-1}. RSB/MnO_x had good regenerability and can maintain about 90% sorption property after 4 rounds."

Mia, S, FA Dijkstra, B Singh - Plant and Soil, 2018. "Enhanced Biological **Nitrogen Fixation** and Competitive Advantage of Legumes in Mixed Pastures Diminish with Biochar Aging." *Springer*. https://link.springer.com/article/10.1007/s11104-018-3562-4.

From the Abstract: "The amount of N fixed was reduced by field aged biochar, ... Moreover, in the field study grasses became more competitive than legumes with biochar"

Egene, CE, RP Van, YS Ok, … E Meers - The Science of the total, 2018. "Impact of Organic Amendments (Biochar, Compost and Peat) on **Cd and Zn** Mobility and Solubility in Contaminated Soil of the Campine Region after Three Years." *Europepmc.org*. http://europepmc.org/abstract/med/29339263.

From the Abstract: "Over the three-year period, the 2% biochar addition resulted in an average decrease in pore water concentration of 40% for Cd and 48% for Zn whereas the 4% addition led to an average decrease of 66% for Cd and 77% for Zn."

Ji, C, L Meng, H Wang - Environmental Science and Pollution Research, 2018. "Enhanced Reductive Dechlorination of **1, 1, 1-Trichloroethane** Using Zero-Valent Iron-Biochar-Carrageenan Microspheres: Preparation and Microcosm Study." *Springer*. https://link.springer.com/article/10.1007/s11356-018-1235-8.

From the Abstract: "After 25-day incubation with the composite prepared under optimized conditions, the removal efficiency of 1,1,1-TCA was 95.68%, which was 24.69% higher than that observed in the microcosm with a commercial remediation material."

Wang, Hailong, Xing Yang, Lizhi He, Kouping Lu, Karin Müller, Kim McGrouther, Song Xu, et al. 2018. "Using Biochar for **Remediation of Contaminated Soils**." In *Twenty Years of Research and Development on Soil Pollution and Remediation in China*, 763–83. Singapore: Springer Singapore. https://doi.org/10.1007/978-981-10-6029-8_47.

Palviainen, Marjo, Frank Berninger, Viktor J. Bruckman, Kajar Köster, Christine Ribeiro Moreira de Assumpção, Heidi Aaltonen, Naoki Makita, et al. 2018. "Effects of Biochar on **Carbon and Nitrogen Fluxes** in Boreal Forest Soil." *Plant and Soil*, January. https://doi.org/10.1007/s11104-018-3568-y.

From the Abstract: ""The results suggest that wood biochar amendment rates of 5–10 t ha^{-1} to boreal forest soil do not cause large or long-term changes in soil CO_2 effluxes or reduction in native soil C stocks. Furthermore, the results imply that biochar does not adversely affect soil microbial biomass or key N cycling processes in boreal xeric forests ... Thus, it seems that biochar is a promising tool to mitigate climate change and sequester additional C in boreal forest soils."

Zhang, L, X Liu, X Huang, … W Wang - Environmental, 2018. "Adsorption of **Pb2+** from Aqueous Solutions Using Fe-Mn Binary Oxides-Loaded Biochar : Kinetics, Isotherm and Thermodynamic Studies." *Taylor & Francis*. http://www.tandfonline.com/doi/abs/10.1080/09593330.2018.1432693.

From the Abstract: "With the initial Pb^{2+} concentration of 200 mg/L, pH 4, and 298.15 K, the optimum adsorption ... was obtained at a reaction time of 300 min, adsorbent dose of 2 g/L, and maximum adsorption capacity of 113.715 mg/g."

Puga, AP, MCA QUEIROZ, and … MAV Ligo - … Meio Ambiente-Artigo. "Solubility and availability of nitrogen from mineral fertilizers and **fertilizers** formulated with biochar." *Alice.cnptia.embrapa.br*. https://www.alice.cnptia.embrapa.br/handle/doc/1085960.

From the Abstract: "The fertilizers formulated with BC and urea presented lower rates of solubilization and availability of N, when compared to formulations of BC and ammonium sulfate. In both cases, however, formulations with BC showed potential as slow release nitrogen fertilizer and presumably increased efficiency, compared to conventional sources of urea and ammonium sulfate."

Yoo, G, YO Lee, TJ Won, … JG Hyun - The Science of the total, 2018. "Variable Effects of Biochar Application to Soils on Nitrification-Mediated **N2O Emissions**." *Ncbi.nlm.nih.gov*. https://www.ncbi.nlm.nih.gov/pubmed/29358139.

From the Abstract: "Mitigation potential of biochar application should be reconsidered if biochar and urea were amended to dry soils with low C contents."

Wang, Q, MK Awasthi, X Ren, J Zhao, R Li - … (New York, undefined NY), 2018. "Combining Biochar, Zeolite and Wood Vinegar for **Composting of Pig Manure**: The Effect on Greenhouse Gas Emission and Nitrogen Conservation." *Ncbi.nlm.nih.gov*. https://www.ncbi.nlm.nih.gov/pubmed/29358021.

From the Abstract: "...10%[Biochar] + 10%[Zeolite] + 2%[Wood Vinegar] is suggested for efficient [Pig Manure] composting."

OKUMURA, Yukihiko奥村幸彦 - 環境工学総合シンポジウム講演論文集, 2017. "A study on the improvement of the **gasification rate** of biomass-derived char by supporting the catalyst." *Jstage.jst.go.jp*. https://www.jstage.jst.go.jp/article/jsmeenv/2017.27/0/2017.27_210/_article/-char/en.

From the Abstract: "The present study examined the mechanism underlying the enhancement of the gasification rate of biomass char when potassium (K) or iron (Fe) was supported on the char. ... When K was supported on the char, the gasification rate increased as the support ratio increased up to 10 wt%. ... the gasification rate was markedly lower when Fe was supported than when K was supported."

Salgado, M de Fatima, … AM Abioye - … Series: Earth and, 2018. "Preparation of **Activated Carbon** from Babassu Endocarp under Microwave Radiation by Physical Activation." *Iopscience.iop.org*. http://iopscience.iop.org/article/10.1088/1755-1315/105/1/012116/meta.

From the Abstract: "... activated carbon with a rather well-developed porosity [produced] by pyrolysis and physical activation by two-steps with CO_2 activation via microwaves radiation. The activated carbon, with a low production cost, could be suitable for applications in gaseous pollutant adsorption, adsorb iodine, methylene blue, and residual chlorine."

Campbell, RM, NM Anderson, DE Daugaard - Energies, 2018. "Technoeconomic and Policy Drivers of Project Performance for Bioenergy Alternatives Using Biomass from **Beetle-Killed Trees**." *Mdpi.com*. http://www.mdpi.com/1996-1073/11/2/293.

From the Abstract: "Over a 20-year project period, results for base case scenarios reveal mean NPV ranging from a low of −$8.3 million for electric power production to a high of $76.0 million for liquid biofuel with a biochar co-product."

Hu, X, Y Xue, L Liu, Y Zeng, L Long - Environmental Science and Pollution, 2018. "Preparation and Characterization of Na2S-Modified Biochar for **Nickel Removal**." *Springer*. https://link.springer.com/article/10.1007/s11356-018-1298-6.

From the Abstract: "...modified corncob biochar (450 °C) showed the best Ni^{2+} adsorption. ...Findings from this work suggest that modified biochar can be used as an effective adsorbent for the removal of Ni^{2+} from wastewater."

Salo, E. 2018. "Current State and Future Perspectives of Biochar Applications in **Finland**." https://jyx.jyu.fi/dspace/handle/123456789/56920.

Li, R, W Liang, H Huang, S Jiang, D Guo, and … M Li - Journal of Applied. "Removal of **Cadmium (II)** Cations from an Aqueous Solution with Aminothiourea Chitosan Strengthened Magnetic Biochar." *Wiley Online Library*. http://onlinelibrary.wiley.com/doi/10.1002/app.46239/full.

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