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Best Papers from 2022 published in the *Environmental Science* journals of the Royal Society of Chemistry

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As we (ZC, ND, KJ, KM, CM, PN, PV) celebrate the best papers published by the *Environmental Science* family of journals in 2022, we like to put on record our thanks, as always, to the many colleagues who generously gave their time and intellectual input, serving as reviewers for our journals. Publication of quality papers relies on quality, timely reviews. The system of academic rigour that we all rely on in publishing our work is totally dependent on the commitment of peer-review. We truly appreciate your – often uncredited – contributions.

In 2022 we published a total of 925 papers across our *Environmental Science* portfolio, covering areas ranging from nanocellulose biotextiles, to organic aerosols, to microplastics in ecosystems. We are excited that this year, publications from our newest Open Access companion journal *Environmental Science: Advances* have also been included in this year's *Environmental Science* best papers round up.

During the first months of 2023, we enlisted our Advisory Boards, Editorial Boards, and Associate Editors to choose the very best papers published in our journals in 2022. Their selection provides examples of the compelling research published in the *Environmental Science* family of journals and of the research that we are privileged to bring to you each month.

We are proud to introduce you to the overall selection of Best Papers and Best Review Papers from *Environmental Science: Advances*, *Environmental Science: Atmospheres*, *Environmental Science: Nano*, *Environmental Science: Processes & Impacts* and *Environmental Science: Water Research & Technology*.

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Environmental Science: Advances

Best Paper: Mattoli, Proietti, Quintiero, Fodaroni, Burico, Gianni, Giovagnoni, Mercati and Santi, **New insight into the evaluation of complex mixture biodegradability: an UHPLC-qToF "all-ion MS/MS" acquisition technique for the untargeted and targeted analysis of pharmaceutical formulation biodegradation**, *Environ. Sci.: Adv.*, 2022, **1**, 725–735, **https://doi.org/10.1039/D1VA00038A**.

This important paper addresses some of the limitations in understanding the fate of chemical mixtures. Using a new approach, it shows that when organic molecules are partially degraded, a pool of new unknown compounds can be produced. Using a pharmaceutical formulation as their case study, the authors demonstrated that UHPLC-qToF analysis can be a modern alternative, which can give more accurate profiling of the products of biodegradation, by coupling targeted and untargeted methods.

Runner-up Best Paper: Schiros, Antrobus, Farías, Chiu, Joseph, Esdaille, Sanchirico, Miquelon, An, Russell, Chitu, Goetz, Verploegh Chassé, Nuckolls, Kumar and Lu, **Microbial nanocellulose biotextiles for a circular materials economy**, *Environ. Sci.: Adv.*, 2022, **1**, 276–284, **https://doi.org/10.1039/D2VA00050D**.

Best Review: Roy, Mohanty and Misra, **Microplastics in ecosystems: their implications and mitigation pathways**, *Environ. Sci.: Adv.*, 2022, **1**, 9–29, **https://doi.org/10.1039/D1VA00012H**.

Environmental Science: Atmospheres

Best Paper: Milsom, Squires, Skoda, Gutfreund, Mason, Terrill and Pfrang, **The evolution of surface structure during simulated atmospheric ageing of nano-scale coatings of an organic surfactant aerosol proxy**, *Environ. Sci.: Atmos.*, 2022, **2**, 964–977, **https://doi.org/10.1039/D2EA00011C**.

Milsom *et al.* describe a detailed experimental examination of oleic acid and sodium oleate coatings on glass (silicone dioxide). They combine advanced methods to explore the surface structure of coatings before and after aging by ozone. This exploits a long-standing model system (oleic acid) used in atmospheric aerosol research, addressing the complementary topics of surface films (indoors and outdoors) and ambient aerosols. They show that lamellar bilayers persist after aging but that hygroscopicity increases dramatically and that anisotropic diffusion (much more rapid in the plane of the bilayers) is potentially an important barrier to transport both into films and ambient aerosols. This provides important insight into how details of molecular structure and emergent morphology may have a strong influence on the environmental persistence of compounds, bridging fundamental physical chemistry and environmental chemistry.

Runner-up Best Paper: Liu-Kang, Gallimore, Liu and Abbatt, **Photoreaction of biomass burning brown carbon aerosol particles**, *Environ. Sci.: Atmos.*, 2022, **2**, 270–278, https://doi.org/10.1039/D1EA00088H.

Best Review: Gen, Liang, Zhang, Mabato and Chan, **Particulate nitrate photolysis in the atmosphere**, *Environ. Sci.: Atmos.*, 2022, **2**, 111–127, https://doi.org/10.1039/D1EA00087J.

Best Emerging Investigator series paper: Wokosin, Schell and Faust, **Emerging investigator series: surfactants, films, and coatings on atmospheric aerosol particles: a review**, *Environ. Sci.: Atmos.*, 2022, **2**, 775–828, https://doi.org/10.1039/D2EA00003B.

Environmental Science: Nano

Best Paper: Hansjosten, Takamiya, Rapp, Reiner, Fritsch-Decker, Mattern, Andraschko, Anders, Pace, Dickmeis, Peravali, Rastegar, Strähle, Hsiao, Gilliland, Ojea-Jimenez, Ambrose, Belinga-Desaunay-Nault, Khan, Lynch, Valsami-Jones, Diabaté and Weiss, **Surface functionalisation-dependent adverse effects of metal nanoparticles and nanoplastics in zebrafish embryos**, *Environ. Sci.: Nano*, 2022, **9**, 375–392, https://doi.org/10.1039/D1EN00299F.

There are a myriad of different nanomaterial formulations that can potentially interact with environmental organisms. In this paper, Hansjosten and colleagues summarize their efforts to develop a zebrafish embryo assay that provides the capacity to systematically evaluate how different surface functionalizations result in potentially adverse impacts. Through the use of automated microscopy, the group was able to test how metal and metal oxide nanomaterials as well as nanoplastics, affect zebrafish motility, hatching, and other relevant endpoints. Through this extensive effort, Hansjosten and colleagues were able to show that interference with hatching was the most sensitive endpoint. This work highlights the importance of not only the identity of the core nanomaterial, but also the role that surface functionalization plays in determining toxicity.

Runner-up Best Paper: Hu, Jia, Wu, Zhang, Wang, Liu, Yang, Tao and Wang, **Carbon dots can strongly promote photosynthesis in lettuce (*Lactuca sativa* L.)**, *Environ. Sci.: Nano*, 2022, **9**, 1530–1540, https://doi.org/10.1039/D1EN00948F.

Best Review: Hu, Wen and Ou, **Construction of adsorbents with graphene and its derivatives for wastewater treatment: a review**, *Environ. Sci.: Nano*, 2022, **9**, 3226–3276, https://doi.org/10.1039/D2EN00248E.

Best Emerging Investigator series paper: Wang and Liu, **Emerging investigator series: metal nanoparticles in freshwater: transformation, bioavailability and effects on invertebrates**, *Environ. Sci.: Nano*, 2022, **9**, 2237–2263, https://doi.org/10.1039/D2EN00052K.

Environmental Science: Processes & Impacts

Best Paper: Pütz, Namazkar, Plassmann and Benskin, **Are cosmetics a significant source of PFAS in Europe? product inventories, chemical characterization and emission estimates**, *Environ. Sci.: Processes Impacts*, 2022, **24**, 1697–1707, https://doi.org/10.1039/D2EM00123C.

In this work, Pütz and coworkers examine the prevalence of fluorinated compounds in cosmetic products. Using a combination of database research, experimental analytical determinations, and emissions modeling, they were able to arrive at an estimated range for the amount of fluorinated compounds in these consumer products and also to estimate the emissions of fluorinated compounds *via* wastewater and solid waste routes. This work gives an important glimpse into how everyday consumer behavior can be an invisible route to chemical exposure and as a source of contaminants to our waste streams.

Runner-up Best Paper: Kim, Pike, Gray, Sprankle, Faust and Edmiston, **Non-targeted identification and semi-quantitation of emerging per- and polyfluoroalkyl substances (PFAS) in US rainwater**, *Environ. Sci.: Processes Impacts*, 2023, https://doi.org/10.1039/D2EM00349J.

Best Review: Kormos, Lin, Pruden and Marr, **Critical review of antibiotic resistance genes in the atmosphere**, *Environ. Sci.: Processes Impacts*, 2022, **24**, 870–883, https://doi.org/10.1039/D2EM00091A.

Best Emerging Investigator series paper: Scholes, **Emerging investigator series: contributions of reactive nitrogen species to transformations of organic compounds in water: a critical review**, *Environ. Sci.: Processes Impacts*, 2022, **24**, 851–869, https://doi.org/10.1039/D2EM00102K.

Environmental Science: Water Research & Technology

Best Paper: Gao, Xie and Liu, **Algae control in oligotrophic surface water under the joint effect of nutritional competition and microbial algae-lytic substance**, *Environ. Sci.: Water Res. Technol.*, 2022, **8**, 375–384, https://doi.org/10.1039/D1EW00563D.

This paper explores the ability of algae-lysing bacteria to control the proliferation of harmful algal blooms. These bacteria, added as biofilm attached

to polyhydroxyalkanoate–starch granules, also helped reduce nitrate, nitrite, and ammonium concentrations to levels that also inhibited algal growth *via* nutrient competition/limitation. This paper offers an exciting new prospect for controlling harmful algal blooms in surface water.

Runner-up Best Paper: McLachlan, Li, Jonsson, Kaserzon, O'Brien and Mueller, **Removal of 293 organic compounds in 15 WWTPs studied with non-targeted suspect screening**, *Environ. Sci.: Water Res. Technol.*, 2022, **8**, 1423–1433, **https://doi.org/10.1039/D2EW00088A**.

Best Review: Esfahani, Zeidabadi, Zhang and Mohseni, **Photo-chemical/catalytic oxidative/reductive decomposition of per- and poly-fluoroalkyl substances (PFAS), decomposition mechanisms and effects of key factors: a review**, *Environ. Sci.: Water Res. Technol.*, 2022, **8**, 698–728, **https://doi.org/10.1039/D1EW00774B**.

Best Emerging Investigator series paper: Mantilla-Calderon, Huang, Li, Chibwe, Yu, Ye, Liu and Ling, **Emerging investigator series: meta-analyses on SARS-CoV-2 viral RNA levels in wastewater and their correlations to epidemiological indicators**, *Environ. Sci.: Water Res. Technol.*, 2022, **8**, 1391–1407, **https://doi.org/10.1039/D2EW00084A**.

We congratulate the authors of each of these papers for their excellent work and take this opportunity to thank them for submitting their work to the *Environmental Science* family of journals. We extend our thanks to all of our authors for sharing the fruits of your hard labor through our journals as well as to our reviewers whose selfless work underpins every article we publish. We also thank our Advisory Board and Editorial Board members, as well as our Associate Editors, for their efforts in identifying and evaluating the top papers. We will continue to strive to publish the very best *Environmental Science* papers and look forward to your submissions.

Zongwei Cai, Kevin C. Jones and Celia Manaia
Editors-in-Chief
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