**Khắc phục ô nhiễm vi nhựa trong nước thải**

Hoạt động sinh hoạt và sản xuất kinh tế của con người là tác nhân chính tạo nên rác thải vi nhựa. Các sản phẩm được tạo thành từ hạt vi nhựa như mỹ phẩm, kem đánh răng, xà phòng,… là nguồn phát thải hạt vi nhựa nguyên sinh. Bên cạnh đó, hạt vi nhựa còn có thể được tạo ra từ những sản phẩm lớn hơn như quần áo, đồ chơi, nguyên liệu đóng gói trong quá trình phân hủy được gọi là nguồn phát thải thứ cấp. Cơ chế phát tán hạt vi nhựa của hai nguồn phát thải chính này cũng khác nhau. Trong khi những hạt vi nhựa nguyên sinh có thể được loại bỏ trong quá trình xử lý tại các nhà máy xử lý nước thải trước khi thải ra môi trường thì các hạt vi nhựa đến từ nguồn phát thải thứ cấp thường trực tiếp thải ra môi trường thông qua các hoạt động sinh hoạt đặc biệt là sản xuất nông nghiệp của con người. Sau đó, chúng di chuyển theo hệ thống sông ngòi và trực tiếp thải ra biển.

Ngoài ra hạt vi nhựa còn xuất hiện trong hệ sinh thái đại dương bởi hoạt động đánh bắt và nuôi trồng hải sản trên biển. Hạt vi nhựa có tác động tiêu cực đến hệ sinh thái đặc biệt là hệ sinh thái dưới nước. Chúng tác động thông qua một cơ chế phức tạp trong chu trình của hệ sinh thái. Cuối cùng, chúng tác động đến toàn bộ các loài động vật trong chu trình này, từ những sinh vật phù du đến những sinh vật hàng đầu trong chuỗi như san hô, cá, chim các loài bò sát và động vật có vú sinh sống dưới biển. Ba tác động chính của hạt vi nhựa là ảnh hưởng đến quá trình tiêu hóa, tác động của các chất phụ gia (chất hóa dẻo) và cuối cùng là ảnh hưởng các chất gây ô nhiễm (các chất hữu cơ khó phân hủy) có trong hạt vi nhựa đến sinh vật.

Để hiểu rõ hơn Cục Thông tin KH&CN quốc gia xin giới thiệu một số bài nghiên cứu đã được xuất bản chính thức và các bài viết được chấp nhận đăng trên những cơ sở dữ liệu học thuật chính thống.

**1. Sciencedirect**

1. A critical review on remediation of microplastics using microalgae from aqueous system  
Science of The Total Environment 19 August 2023  
Payal Das, Gopinath Halder, Manisha Bal  
<https://www.sciencedirect.com/science/article/pii/S0048969723050507/pdfft?md5=593ad5365a32391581c887c0e3cea788&pid=1-s2.0-S0048969723050507-main.pdf>

2. Innovations in the Development of Promising Adsorbents for the Remediation of Microplastics and Nanoplastics – A Critical Review  
Water Research 22 December 2022  
Imran Ali, Xiao Tan, Yinlan Ruan  
<https://www.sciencedirect.com/science/article/pii/S0043135422014713/pdfft?md5=f496c59dccc67257e1a81c57e01873b9&pid=1-s2.0-S0043135422014713-main.pdf>

3. Low environmental impact remediation of microplastics: Visible-light photocatalytic degradation of PET microplastics using bio-inspired C,N-TiO2/SiO2 photocatalysts  
Marine Pollution Bulletin 29 June 2023  
Maria Camila Ariza-Tarazona, Cristina Siligardi, Erika Iveth Cedillo-González  
<https://www.sciencedirect.com/science/article/pii/S0025326X23006392/pdfft?md5=149df275af4a50011130245c20d825ac&pid=1-s2.0-S0025326X23006392-main.pdf>

4. Recent advances on nanotechnology-driven strategies for remediation of microplastics and nanoplastics from aqueous environments  
Journal of Water Process Engineering 9 February 2023  
Mariam Ouda, Fawzi Banat, Georgios N. Karanikolos  
<https://www.sciencedirect.com/science/article/pii/S2214714423000600/pdfft?md5=9f495d7cdb43f0687beba8dded80de1b&pid=1-s2.0-S2214714423000600-main.pdf>

5. Dielectric barrier discharge plasma for the remediation of microplastic-contaminated soil from landfill  
Chemosphere 11 January 2023  
Jingyuan Sima, Jun Wang, Guangjie Zhao  
<https://www.sciencedirect.com/science/article/pii/S0045653523000814/pdfft?md5=2870711ccd156885cb5d868773b244e7&pid=1-s2.0-S0045653523000814-main.pdf>

6. Microplastic remediation technologies in water and wastewater treatment processes: Current status and future perspectives  
Science of The Total Environment 14 January 2023  
Yang Lu, Mei-Chun Li, Changtong Mei  
<https://www.sciencedirect.com/science/article/pii/S0048969723002334/pdfft?md5=5841743d6cf2cdef3f0f82a302a79254&pid=1-s2.0-S0048969723002334-main.pdf>

7. Nanomaterials-based adsorbents for remediation of microplastics and nanoplastics in aqueous media: A review  
Separation and Purification Technology 26 October 2022  
Muhammad Sajid, Ihsanullah Ihsanullah, Nadeem Baig  
<https://www.sciencedirect.com/science/article/pii/S1383586622020093/pdfft?md5=479dcb6d428055a2e0254a595c14abee&pid=1-s2.0-S1383586622020093-main.pdf>

8. Microplastics occurrence, detection and removal with emphasis on insect larvae gut microbiota  
Marine Pollution Bulletin 17 January 2023  
Louella Concepta Goveas, Sneha Nayak, Dai Viet N. Vo  
<https://www.sciencedirect.com/science/article/pii/S0025326X23000115/pdfft?md5=1442efbd45f3c47f16b1e30db275e989&pid=1-s2.0-S0025326X23000115-main.pdf>

9. Origination, fate, accumulation, and impact, of microplastics in a marine ecosystem and bio/technological approach for remediation: A review  
Process Safety and Environmental Protection 5 July 2023  
Mathiyazhagan Narayanan  
<https://www.sciencedirect.com/science/article/pii/S0025326X23000115/pdfft?md5=1442efbd45f3c47f16b1e30db275e989&pid=1-s2.0-S0025326X23000115-main.pdf>

10. A study on managing plastic waste to tackle the worldwide plastic contamination and environmental remediation  
Chemosphere 31 August 2023  
A. K. Priya, M. Muruganandam, Satbir S. Sehgal  
<https://www.sciencedirect.com/science/article/pii/S0045653523022488/pdfft?md5=d5030268d07c98b004b99ff17aa685ee&pid=1-s2.0-S0045653523022488-main.pdf>  
  
11. Microplastics toxicity, detection, and removal from water/wastewater  
Marine Pollution Bulletin 12 January 2023  
Kayode Adesina Adegoke, Folasade Abimbola Adu, Oluwasayo Esther Ogunjinmi  
<https://www.sciencedirect.com/science/article/pii/S0025326X22012280/pdfft?md5=05049f33da9ffc3acd128ce6ef3c6fa4&pid=1-s2.0-S0025326X22012280-main.pdf>

12. A discussion of microplastics in soil and risks for ecosystems and food chains  
Chemosphere 23 December 2022  
Zhaolin Li, Yafeng Yang, Christian Sonne  
<https://www.sciencedirect.com/science/article/pii/S0045653522041303/pdfft?md5=785ec518070f07abf2df3517b1bfa3b0&pid=1-s2.0-S0045653522041303-main.pdf>

13. Highly efficient low-temperature biodegradation of polyethylene microplastics by using cold-active laccase cell-surface display system  
Bioresource Technology 18 May 2023  
Ailin Zhang, Yanhua Hou, Jianan Liu  
<https://www.sciencedirect.com/science/article/pii/S0960852423005904/pdfft?md5=6e2126666aaea535977663017c4febbd&pid=1-s2.0-S0960852423005904-main.pdf>

14. Control strategies for microplastic pollution in groundwater  
Environmental Pollution 4 August 2023  
Zhongchuang Liu, Aziz-Ur-Rahim Bacha, Lei Yang  
<https://www.sciencedirect.com/science/article/pii/S0269749123013258/pdfft?md5=b0ea67d91bbb85205aca9b5abbc1aaea&pid=1-s2.0-S0269749123013258-main.pdf>

15. The role of microplastics in the process of laccase-assisted phytoremediation of phenanthrene-contaminated soil  
Science of The Total Environment Available online 22 September 2023  
Xiancao Chen, Yalan Zhu, Chunfeng Guan  
<https://www.sciencedirect.com/science/article/pii/S0048969723059326/pdfft?md5=61c4182e4d80e257f94a0e04e82ab5b3&pid=1-s2.0-S0048969723059326-main.pdf>

16. Microplastics in landfill leachate: Sources, detection, occurrence, and removal  
Environmental Science and Ecotechnology 16 February 2023  
Mosarrat Samiha Kabir, Hong Wang, Renzun Zhao  
<https://www.sciencedirect.com/science/article/pii/S2666498423000212/pdfft?md5=37097c6c7580e45d073da6482c4ea6ec&pid=1-s2.0-S2666498423000212-main.pdf>

17. Microplastics in multimedia environment: A systematic review on its fate, transport, quantification, health risk, and remedial measures  
Groundwater for Sustainable Development 6 January 2023  
Pawan Kumar Rose, Monika Jain, Anoop Yadav  
<https://www.sciencedirect.com/science/article/pii/S2352801X22001667/pdfft?md5=c32e5554371918bdcbcbd8ef6411eaad&pid=1-s2.0-S2352801X22001667-main.pdf>

18. Raman imaging to identify microplastics released from toothbrushes: algorithms and particle analysis  
Environmental Pollution 7 September 2023  
Cheng Fang, Saianand Gopalan, Ravi Naidu  
<https://www.sciencedirect.com/science/article/pii/S0269749123015129/pdfft?md5=2b1ad8288fe0b65126b7b4f7be15dc28&pid=1-s2.0-S0269749123015129-main.pdf>

19. Microplastics as an emerging menace to environment: Insights into their uptake, prevalence, fate, and sustainable solutions  
Environmental Research 21 April 2023  
Anjali Devi, Abish Hansa, Ritika Sharma  
<https://www.sciencedirect.com/science/article/pii/S0013935123007144/pdfft?md5=31054d04bcb1591d4caaf7b1c5e71d5a&pid=1-s2.0-S0013935123007144-main.pdf>

20. The first evidence of microplastic occurrence in mine water: The largest black coal mining area in the Czech Republic  
Water Research 28 August 2023  
Kateřina Brožová, Jan Halfar, Silvie Heviánková  
<https://www.sciencedirect.com/science/article/pii/S0043135423009788/pdfft?md5=7460a7452cdbc263b942587cd1ba5bb3&pid=1-s2.0-S0043135423009788-main.pdf>

21. Countering microplastics pollution with photocatalysis: Challenge and prospects  
Progress in Natural Science: Materials International Available online 9 August 2023  
Runjing Xu, Lifeng Cui, Shifei Kang  
<https://www.sciencedirect.com/science/article/pii/S1002007123000631/pdfft?md5=4b6a584137e9e679c3062647ff01d4e6&pid=1-s2.0-S1002007123000631-main.pdf>

22. In-situ and real-time nano/microplastic coatings and dynamics in water using nano-DIHM: A novel capability for the plastic life cycle research  
Water Research 21 March 2023  
Zi Wang, Abolghasem Pilechi, Parisa A. Ariya  
<https://www.sciencedirect.com/science/article/pii/S0043135423003342/pdfft?md5=67d802dd947f88edacfe178c4c59e948&pid=1-s2.0-S0043135423003342-main.pdf>

23. Inhibitory effect of polyethylene microplastics on roxarsone degradation in soils  
Journal of Hazardous Materials 23 April 2023  
Jie-wen Ma, Ya-qing Wu, Yu Yan  
<https://www.sciencedirect.com/science/article/pii/S0304389423007665/pdfft?md5=368a085b618127a95c97e77fa879a55e&pid=1-s2.0-S0304389423007665-main.pdf>

24. Sources and identification of microplastics in soils  
Soil & Environmental Health 23 May 2023  
Weixin Fan, Chunsheng Qiu, Xin Tang  
<https://www.sciencedirect.com/science/article/pii/S2949919423000195/pdfft?md5=6f6b0033ff63df93d11bc12920d1eccf&pid=1-s2.0-S2949919423000195-main.pdf>

25. Microplastics in soils during the COVID-19 pandemic: Sources, migration and transformations, and remediation technologies  
Science of The Total Environment 25 April 2023  
Shan Zhao, Jian Zhang  
<https://www.sciencedirect.com/science/article/pii/S0048969723023215/pdfft?md5=b4a61c77e8925634bd293093d4d76286&pid=1-s2.0-S0048969723023215-main.pdf>

26. Microplastics in surface water: occurrence, ecological implications, quantification methods and remediation technologies  
Chemical Engineering Journal 25 July 2023  
Carolina Rodrigues dos Santos, Guilherme Pinheiro Drumond, Míriam Cristina Santos Amaral  
<https://www.sciencedirect.com/science/article/pii/S1385894723036677/pdfft?md5=a70b6342666aec4f5ab0a2c3ad339c58&pid=1-s2.0-S1385894723036677-main.pdf>

27. Microplastics in aquatic environments: A comprehensive review of toxicity, removal, and remediation strategies  
Science of The Total Environment 1 March 2023  
A. S. Shafiuddin Ahmed, Md Masum Billah, Wenlong Cai  
<https://www.sciencedirect.com/science/article/pii/S0048969723010306/pdfft?md5=0d48d062fb8edc3b7557d2f9cc580afe&pid=1-s2.0-S0048969723010306-main.pdf>

28. Microplastics in mangroves with special reference to Asia: Occurrence, distribution, bioaccumulation and remediation options  
Science of The Total Environment 12 August 2023  
Avishek Talukdar, Pritha Kundu, Sayan Bhattacharya  
<https://www.sciencedirect.com/science/article/pii/S0048969723047903/pdfft?md5=8ef53be489503e542369a3203f9a5d3d&pid=1-s2.0-S0048969723047903-main.pdf>

29. Fibrous microplastics released from textiles: Occurrence, fate, and remediation strategies  
Journal of Contaminant Hydrology 5 March 2023  
Carlos Rafael Silva de Oliveira, Afonso Henrique da Silva Júnior, Adriano da Silva  
<https://www.sciencedirect.com/science/article/pii/S0169772223000396/pdfft?md5=8e58d88489ea029273a47eb0b9298916&pid=1-s2.0-S0169772223000396-main.pdf>

30. Insights into the degradation of high-density polyethylene microplastics using microbial strains: Effect of process parameters, degradation kinetics and modeling  
Waste Management 12 April 2023  
Sanjeevani Hooda, AnnuPrasenjit Mondal  
<https://www.sciencedirect.com/science/article/pii/S0956053X23002787/pdfft?md5=b7b5ec76002c8dad24c07c7d014668f6&pid=1-s2.0-S0956053X23002787-main.pdf>

31. The influence of various microplastics on PBDEs contaminated soil remediation by nZVI and sulfide-nZVI: Impedance, electron-accepting/-donating capacity and aging  
Science of The Total Environment 3 April 2023  
Xiaoxuan Zhang, Ran Chen, Xinhong Qiu  
<https://www.sciencedirect.com/science/article/pii/S0048969723018521/pdfft?md5=7eef2caaba67dccdb0c757c1d2581d0b&pid=1-s2.0-S0048969723018521-main.pdf>

32. Distribution, sources, transportation and biodegradation of microplastics in the soil environment  
TrAC Trends in Analytical Chemistry 19 May 2023  
Yizheng Li, Qinghui Liu, Jun Wang  
<https://www.sciencedirect.com/science/article/pii/S0165993623001930/pdfft?md5=c9453255ffe7e1e81acd9d5635a8f1c7&pid=1-s2.0-S0165993623001930-main.pdf>

33. Distinctive adsorption and desorption behaviors of temporal and post-treatment heavy metals by iron nanoparticles in the presence of microplastics  
Science of The Total Environment 27 March 2023  
Shuhan Ren, Zhenyi Luo, Ke Yin  
<https://www.sciencedirect.com/science/article/pii/S0048969723017606/pdfft?md5=1474c2bdf013e1beb99238d8a0d0f5db&pid=1-s2.0-S0048969723017606-main.pdf>

34. Microplastics: The stemming environmental challenge and the quest for the missing mitigation strategies  
International Biodeterioration & Biodegradation 10 February 2023  
Dinesh Parida, Rimjhim Sangtani, Kiran Bala  
<https://www.sciencedirect.com/science/article/pii/S0964830523000197/pdfft?md5=c13a9302f7c48e4adec8f161a2cc944b&pid=1-s2.0-S0964830523000197-main.pdf>

35. Micro and nanoplastics ravaging our agroecosystem: A review of occurrence, fate, ecological impacts, detection, remediation, and prospects  
Heliyon 2 February 2023  
Emmanuel Sunday Okeke, Kingsley Ikechukwu Chukwudozie, Charles Ogugua Nwuche  
<https://www.sciencedirect.com/science/article/pii/S2405844023005030/pdfft?md5=13bda4b06ec26257fba867c1b60c2b65&pid=1-s2.0-S2405844023005030-main.pdf>

36. Boat paint and epoxy fragments - Leading contributors of microplastic pollution in surface waters of a protected Andaman bay  
Chemosphere 7 November 2022  
Mahima Jaini, Naveen Namboothri  
<https://www.sciencedirect.com/science/article/pii/S0045653522036761/pdfft?md5=bcad46aa48f705439d2d41b218e609fa&pid=1-s2.0-S0045653522036761-main.pdf>

37. Photocatalysis dramatically influences motion of magnetic microrobots: Application to removal of microplastics and dyes  
Journal of Colloid and Interface Science 13 April 2023  
Paula Mayorga-Burrezo, Carmen C. Mayorga-Martinez, Martin Pumera  
<https://www.sciencedirect.com/science/article/pii/S0021979723006021/pdfft?md5=f4813f24f10416c6e631efad12669448&pid=1-s2.0-S0021979723006021-main.pdf>

38. The role of fluorescent carbon dots in the fate of plastic waste  
Journal of Environmental Chemical Engineering 9 June 2023  
Zahra Hallaji, Zeinab Bagheri, Bijan Ranjbar  
<https://www.sciencedirect.com/science/article/pii/S2213343723010618/pdfft?md5=01da0c7aaf110d9829e05d2b33d43e4b&pid=1-s2.0-S2213343723010618-main.pdf>

39. Surface change of microplastics in aquatic environment and the removal by froth flotation assisted with cationic and anionic surfactants  
Water Research 24 February 2023  
Hongru Jiang, Jiaqi Bu, Chongqing Wang  
<https://www.sciencedirect.com/science/article/pii/S0043135423002294/pdfft?md5=e9fa441949689b1a8fc8a7a9a1eddfa6&pid=1-s2.0-S0043135423002294-main.pdf>

40. Exploring the mechanisms of humic acid mediated degradation of polystyrene microplastics under ultraviolet light conditions  
Chemosphere 28 March 2023  
Xiqing Wang, Atif Muhmood, Shubiao Wu  
<https://www.sciencedirect.com/science/article/pii/S0045653523008111/pdfft?md5=bef1d7ae56563bfb2d2be675079087ba&pid=1-s2.0-S0045653523008111-main.pdf>  
  
41. Effect of potential microplastics in sewage effluent on Nile Tilapia and photocatalytic remediation with zinc oxide nanoparticles  
Environmental Pollution 10 June 2023  
Manal Qayyadh Alanazi, Promy Virk, Ebtesam Abdullah Al-Qahtani  
<https://www.sciencedirect.com/science/article/pii/S026974912300948X/pdfft?md5=ae9796aa77e21a0f69fe818fe370981e&pid=1-s2.0-S026974912300948X-main.pdf>

42. Microplastics as emergent contaminants in landfill leachate: Source, potential impact and remediation technologies  
Journal of Environmental Management 24 May 2023  
Godvin, Sharmila VSurya Prakash Shanmugavel, J. Rajesh Banu  
<https://www.sciencedirect.com/science/article/pii/S0301479723010289/pdfft?md5=ef26cd6c17ad8ec0509a527cdd727c3d&pid=1-s2.0-S0301479723010289-main.pdf>

43. The potential for a plastic recycling facility to release microplastic pollution and possible filtration remediation effectiveness  
Journal of Hazardous Materials Advances 1 May 2023  
Erina Brown, Anna MacDonald, Deonie Allen  
<https://www.sciencedirect.com/science/article/pii/S2772416623000803/pdfft?md5=343a1105577e124abe361e96696ab5a3&pid=1-s2.0-S2772416623000803-main.pdf>

44. Microplastics in terrestrial ecosystem: Sources and migration in soil environment  
Chemosphere 25 January 2023  
U. Surendran, M. Jayakumar, Padmanaban Velayudhaperumal Chellam  
<https://www.sciencedirect.com/science/article/pii/S0045653523002138/pdfft?md5=dcaa51f729d733d2d5f3c89051a06db0&pid=1-s2.0-S0045653523002138-main.pdf>

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