

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202541080045 A

(19) INDIA

(22) Date of filing of Application :23/08/2025

(43) Publication Date : 05/09/2025

(54) Title of the invention : Integrated Microplastic Detection and Filtration System for Clean Drinking Water Applications

(51) International classification :C02F0001000000, C02F0001280000, C02F0001440000, C02F0001320000, H04W0004380000
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

The present invention relates to an integrated microplastic detection and filtration system designed to ensure clean and safe drinking water by combining advanced filtration media with real-time sensing technology. The system incorporates a multi-stage filtration unit capable of capturing a wide range of microplastic particles based on size and polymer type. Simultaneously, it uses embedded optical or spectroscopic sensors to detect microplastic concentration within the water stream, providing instant feedback to users via digital display or IoT connectivity. The invention is modular, scalable, and suitable for domestic, community, and industrial applications. Its intelligent monitoring unit allows for predictive maintenance and alerts users when filter replacement is required, enhancing reliability and operational lifespan. The system contributes to environmental sustainability by enabling responsible water purification practices and reducing microplastic exposure. Designed for energy efficiency and user accessibility, the invention transforms conventional water filters into smart, adaptive systems for modern clean water management.