Statement of Novelty

This study developed an effective, gravity flow self-supplying O_2 and easy-to-maintain bio-enhanced granular-activated carbon dynamic biofilm reactor (BhGAC-DBfR) for on-site GW treatment. Division of saturated and unsaturated zones favors the formation of aerobic-anoxic-anaerobic biofilm in the reactor. The related genus and enzymes in the multifunctional biofilm enabled the efficient and simultaneous removal of organics and N. Key is that adsorption and biodegradation play important and distinct roles in the quick uptake and continuous removal of both organics and N. This study offers a promising engineering alternative technology with great potential to achieve efficient and low-energy-input GW treatment.