

Valorization of discarded face mask for bioactive compound synthesis and photodegradation of dye

ABSTRACT

To keep COVID-19 at bay, most countries have mandated the use of face masks in public places and imposed heavy penalties for those who fail to do so. This has inadvertently created a huge demand for disposable face masks and worsened the problem of littering, where a large number of used masks are constantly discarded into the environment. As such, an efficient and innovative waste management strategy for the discarded face mask is urgently needed. This study presents the transformation of discarded face mask into catalyst termed 'mask waste ash catalyst (MWAC)' to synthesise bisindolymethanes (BIMs), alkaloids that possess antibacterial, antioxidant and antiviral properties. Using commercially available aldehydes and indole, an excellent yield of reaction (62–94%) was achieved using the MWAC in the presence of water as the sole solvent. On the other hand, the FT-IR spectrum of MWAC showed the absorption bands at 2337 cm^{-1} , 1415 cm^{-1} and 871 cm^{-1} , which correspond to the signals of calcium oxide. It is then proposed that the calcium oxides mainly present in MWAC can protonate oxygen atoms in the carbonyl molecule of the aldehyde group, thus facilitating the nucleophile attack by indole which consequently improved the product yield. Moreover, the MWAC is also observed to facilitate the photodegradation of methylene blue with an efficiency of up to 94.55%. Our results showed the potential applications of the MWAC derived from discarded face masks as a sustainable catalyst for bioactive compound synthesis and photodegradation of dye compounds.