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Green synthesis of zero valent iron particles using *Coffea arabica*

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Zero valent iron particles (ZVIPs) have received extensive attention due to their remarkable activity and effectiveness in groundwater treatment and site remediation. Green synthesis of metal materials using plant extracts is recognized as potential remediation to treat contaminated water in the environment due to the availability of polyphenols and reducing sugars. Here we opted for a novel, simple and cost-effective green synthesis of ZVIPs by the reduction of Fe^{2+} into Fe^0 using bioactive substances obtained from the leaf extract of *Coffea Arabica*. ZVIPs were synthesized by adding the green extracts to 0.01 M $FeSO_4$ with a volume ratio of 2:1 at room temperature and constantly stirring for 1 hr. ZVIPs were characterized by Fourier transform infrared spectroscopy (FT-IR) and scanning electron microscopy (SEM). According to the SEM analysis, the ZVIPs are spherical shaped, and the mean particle size was found to be between 50 - 200 nm. The FT-IR spectrum confirms the formation of the ZVIPs which were later oxidized into iron oxide due to the exposure to air and water. The absorption peaks at 550.10 cm^{-1} and 500.83 cm^{-1} correspond to Fe-O-Fe and Fe-O stretching vibrations, respectively. Also, other peaks indicate the attachment of compounds such as polyphenols of the green extract onto the iron particles which act as capping and dispersive agents. The presence of organic molecules on ZVIPs facilitate no toxicity and less effects on the aquatic organism's growth, photosynthesis, reproduction, suggesting a lower risk in utilizing these functional iron particles for environmental applications.

Keywords: Zero valent Iron particle, Water treatment, Green synthesis

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