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ORIGINAL PAPER

Fabrication of Paper Sensor for Rapid Screening of Nanomaterial Synthesizing Potential of Plants

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Abstract

Numerous reports are available for the use of plant extract in nanoparticles synthesis. The traditional methodologies adopted for analyzing nanosynthesis potential of plant materials is tedious and time-consuming. Rapid, selective, low-cost and easy protocols for on-site detection of nanoparticles synthesizing potential of plant extract have tremendous potential in nanotechnology. In the present study, a simple and selective nanoparticles synthesis screening approach is developed by coating metal salts (precursor for metal nanoparticles) on an inert paper strip and allowing them to react with test plants extract such as plant latex, whose nanosynthesis potential have to be screened. The visual color change of paper strip after reaction of metal salts with latex is the ultimate colorimetric endpoint indicating the formation of nanoparticles. Diverse nanoanalysis techniques qualitatively confirmed the nanoparticles formed on the paper strip. UV–visible spectroscopy exhibit characteristic absorption peaks for AuNPs and AgNPs at around 520 and 430 nm. Scanning electron microscopy confirms the size of 87 and 114 nm for AuNPs and AgNPs. The simplicity, selectivity and rapid response make this approach a promising layman-friendly, on-site useful detection tool. This screening platform can rapidly screen diverse plant species for their capacity to fabricate nanoparticle to select most potent species.

Keywords Rapid nano-screening · Silver and gold nanoparticles · Plant latex · Paper strip · On-site detection

Introduction

Rapid development in nanotechnology has increased the use of nanomaterials in several sectors such as agriculture, medicine, food, health, and energy [1–3]. Around 2300 nano-based products are available just within the European market with an estimated annual nanomaterial production up to thousands of tons/year [4]. Inorganic metal nanoparticles are an essential element of nanotechnology and are a topic of interest among researchers working in different disciplines [5]. Silver and gold nanoparticles gained extensive attention in both research and industrial platform, owing to their utility in diverse areas such as biocidal agent, textiles, food packaging, biosensors, nanocomposites, nanoelectronics, nanodiagnostics, cosmetics, and bioremediation [6–9]. Currently, large-scale synthesis of nanomaterials is achieved by chemical and physical methods. However, hazardous and toxic effects of these methods (and hence nanoparticles synthesized by these methods) are well established as a cause of high concern [10, 11]. Thus there is increased pressure on

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