

(12) PATENT APPLICATION PUBLICATION

(21) Application No.202331065436 A

(19) INDIA

(22) Date of filing of Application :29/09/2023

(43) Publication Date : 20/10/2023

(54) Title of the invention : A NOVEL APPROACH FOR THE SYNTHESIS AND CHARACTERIZATION OF NANOPARTICLES WITH ENHANCED CATALYTIC ACTIVITY

(51) International classification	:B01J0037030000, B82Y0030000000, A61K0009510000, C07C0209360000, C02F0101380000
(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 method for the synthesis and characterization of platinum nanoparticles with a focus on enhanced catalytic activity. The synthesis method involves precise control over nanoparticle properties, including size and surface characteristics, through the use of a green chemistry-based approach. The resulting nanoparticles exhibit exceptional stability and are thoroughly characterized through advanced techniques such as TEM, SEM, EDS, XPS, and XRD. Surface properties are evaluated using FTIR and zeta potential measurements. Furthermore, the catalytic potential of these nanoparticles is demonstrated through the hydrogenation of nitrobenzene to aniline, with optimized reaction conditions yielding a remarkable 95% conversion rate within the first 2 hours. Optimization of precursor utilization reduces material wastage, promoting resource efficiency. These nanoparticles serve as eco-friendly catalyst alternatives, contributing to reduced emissions and energy consumption in chemical processes.

No. of Pages : 13 No. of Claims : 4