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Novel technique for producing metal nanoparticles for different applications

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In the present work, we introduce for the first time, a novel and smart physical method for producing pristine aluminium nanoparticles (Al NPs) through the effect of ultrasonic waves upon Al thin film immersed in different liquids for different applications. Our method for producing Al NPs has many advantages over than other chemical and physical methods such as: (1) Producing Al NPs with low-cost and easy procedures, (2) producing pristine Al NPs without any chemical additives and (3) producing Al NPs in different liquids for different applications. We have prepared pristine Al NPs in 1,2-dichlorobenzene (DCB) which is used as a solvent for preparing solutions of organic solar cell active layer, poly(3,4-ethylene dioxythiophene)-blend-poly(styrene sulfonate) (PEDOT:PSS) which is used as a buffer layer in organic solar cells and ethanol which represents as a polar solvent. Particularly for organic solar cell applications, we blended Al NPs dispersed in DCB with active layer solution which was prepared using the same solvent (DCB). We found that the blending of our Al NPs in solar cell active layer improved power conversion efficiency of the investigated organic solar cell as a result of plasmonic effect caused by Al NPs and light scattering caused by large Al particles.

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