

Surface Conductive Graphene-wrapped Micro-motors Exhibiting Enhanced Motion

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Abstract

Janus micro/nano-motors have attracted significant research interest recently, and we fabricated Janus micro/nano motors driven by both bio-catalytic and catalytic reactions.^[1] However, rising argument on fundamental motion of catalytic Janus spherical motors requires in practice experimental support. Surface conductive Janus motors might be able to give answers to the question of neutral/ionic diffusiophoresis and electrophoresis. Thus, we delicately introduce conductive 2-D nanomaterial, reduced graphene oxide (RGO),^[2] to fabricate surface conductive Janus spherical motors. Given the same H₂O₂ fuel concentration, the velocity of the new motors is enhanced by about 100 % comparing to Janus motors with insulating surface. The velocity increase is partially attributed to improved catalytic activity due to presence of RGO and surface roughness.^[3] Meanwhile, the result infers possible existence of charge transfer through motor's surface, which enhances ionic species diffusion and thus further increase motors' velocity.^[4] In addition to new fundamental findings, the presence of RGO on the surface of micromotors opens many possibilities from biomedical to water remediation applications.

References

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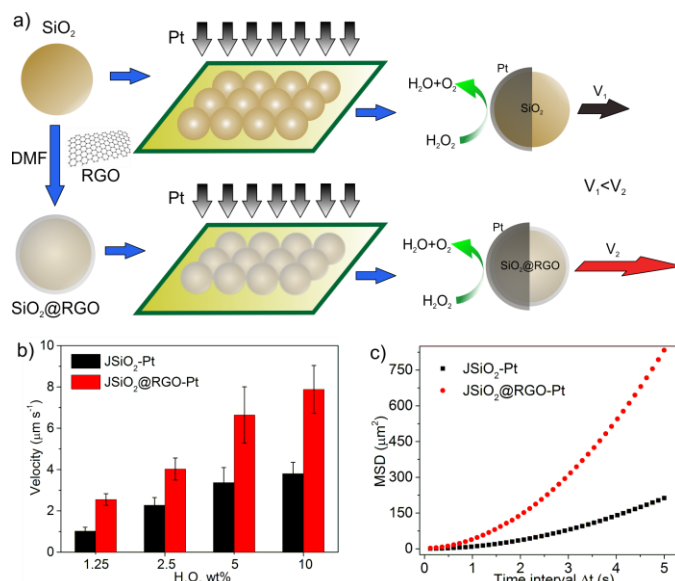


Figure 1. a) Schematic illustration of fabrication of Janus SiO₂-Pt micro-motors and reduced graphene oxide wrapped Janus SiO₂@RGO-Pt micro-motors, b) Velocity comparison and c) Mean-square-displacement plot of the two motors.