# Graphene supported laser generated size-tailored nanocrystals for sodium storage favoured by downsizing-promoted kinetics

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## ABSTRACT

Decorating graphene sheets with well-tailored nanocrystals has been the focus of substantial efforts for challenging energy storage owing to the synergistic effect of 2D graphene and size-dependent properties of nanocrystals. However, due to the limitations of synthetic strategies, multinary metal oxides with tailored sizes have been unfortunately rarely investigated for most inorganic nanoparticles. We herein demonstrate graphene-supported multinary metal oxides with uniform sizes ranging from submicrometer scale down to less than 10 nm by pulse laser irradiation strategy. The nanoparticle size can be readily modulated by varying the laser fluence/irradiation time and concentration of suspension. We further found that the rich oxygen vacancies and the dramatically reduced dimensions of $BiVO_4$ upon pulsed laser irradiation result encouragingly in unprecedented fast, more surface-controlled sodium storage behaviour. The revolutionized sodium storage process found in sub-10-nm $BiVO_4$ nanocrystals results in outstanding properties including extraordinary rate capability and remarkable cycling stability.