Tribotronic control and energy storage attributes of metal-oxide nanofluid interfaces

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A Quartz Crystal Microbalance (QCM) technique has been employed to tune friction at liquid-solid interfaces with tribotronic methods, employing externally applied electric fields in nanoparticle suspension and ionic liquid systems [1-3]. The setup consists of a QCM immersed in liquid containing electrically charged constituents whose sensing electrode is parallel to a nearby counter electrode. An electric field perpendicular to the QCM surface is created when a potential is applied between the two electrodes, which allows the charged constituents in the surrounding liquid to be repositioned [1,2]. For the case of nanosuspensions, the solid-suspension interfaces were also explored using cyclic voltammetry (CV) techniques [3]. Both CV and QCM measurements were able to detect differences under various field conditions, allowing detectable tuning of the friction and electrochemical attributes. Interfacial friction levels in all cases were observed to change as the charged constituents' positions were adjusted with electric fields. For electric fields of sufficient amplitude and duration, the TiO_2 nanosuspension exhibited properties consistent with reversible electrophoretic deposition of the nanoparticles, accompanied by changes in the electrochemical attributes of the electrode itself [1-3]

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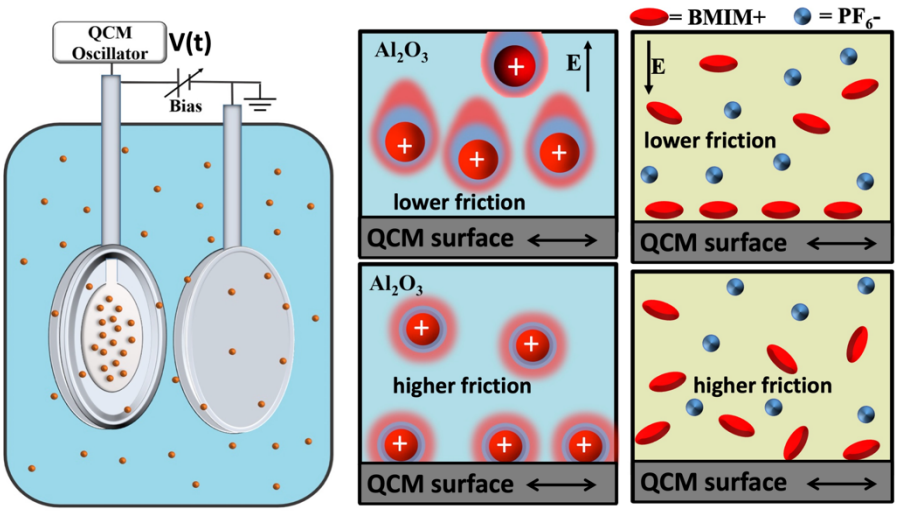

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