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Nanotechnologies – Performance evaluation of nanosuspensions containing clay nanoplates for quorum quenching

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Nanotechnologies – Évaluation des performances des nanosuspensions de nanofeuillets d'argile pour le quorum quenching

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Foreword

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~~The committee responsible for this~~ This document ~~is~~ was prepared by Technical Committee ISO/TC 229, Nanotechnologies.

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Introduction

Among the abundant minerals in the earth's crust, the naturally occurring clays in the class of phyllosilicates such as smectite, talc, and mica are layer silicates existed as laminated mass. The stacks of smectite can be exfoliated into individual clay nanoplates of high surface area and high charge density on the surface. Due to the presence of the surface charges, the clay nanoplate gives rise to a strong electrostatic and charge attraction on microbial surface. The clay nanoplates can be further modified by introducing various surfactants to enhance their functions for inhibiting bacterial growth through quorum quenching interactions. The clay nanoplate suspension in water is designed to inhibit the growth of pathogenic bacteria for crop protection from diseases. Moreover, as an additional benefit, harvesting yield increased.

The antibacterial efficacy is attributed to the unique combinations of chemical and physical properties including the nanoplate shape and size dimension, high surface area, ionic charge attraction, and water dispersion stability. These combined characteristics in a single nanoplate enable for a long-term antibacterial effect. The inter-relation between clay nanoplate characteristics and antibacterial performance are described in [Annex A](#). The quorum quenching ability depends on the interaction of clay nanoplates with bacterial signaling molecules and bacterial surfaces. It can be used as the standard for quality control for the clay nanoplate, and more importantly, the antimicrobial efficacy by using clay nanoplates can be measured and predicted. The correlation between quorum quenching ability and antibacterial performance are described in [Annex B](#).

This document does not cover safety and environmental aspects. Some safety of clay nanoplate regarding the cytotoxicity and genotoxicity toward human cell, oral lethal dose (LD₅₀), and aquatic toxicity are described in [Annex C](#).

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