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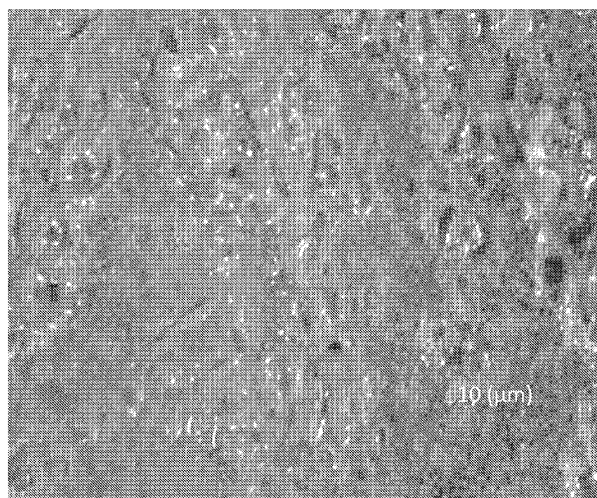
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- (72) Inventors; and  
(71) Applicants: **LIU, Feipeng** [US/US]; 24602 COMMUNITY CENTER DR, SPRING, Texas 77389 (US). **LAI, Yuning** [US/US]; 24602 COMMUNITY CENTER DR, SPRING, Texas 77389 (US).
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(54) Title: MULTIFUNCTIONAL COATINGS AND CHEMICAL ADDITIVES



**Figure 2c.** A topographic view of the typical coating (notebook: PMSI\_2\_81\_1) on the top of a glass substrate. Contour and rough surface morphology featured with mountain, valley, ridge, and hole are clearly shown.

(57) **Abstract:** Multifunctional coatings and chemical additives, comprising of lubricant, micro/nano-textured particles, emulsifiers, hydrogel polymers, cross-linking agent to modify the hydrogel polymers, antimicrobial to preserve the bio-based materials, and water solvent, are useful in hydraulic fracturing operation either directly applied on the surface of proppants, or/and mixed with other friction reducer additives to totally or partially substitute the regular friction reducer chemicals, alternatively, as additive components blended or mixed into regular fracturing fluid for easily pumping proppants downhole and stabilizing the pumping pressure; beneficial to the well productivity, effectively suppress and mitigate the risk of respirable microcrystalline dust as the coated materials are transported and handled in the manufacturing plant, terminal, and oil application fields without a need for drying operation on the coating products.

[Continued on next page]

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