Sol-Gel Hyper-Hydrophilic Anti-Fog Coatings Study & Model of Surface Condensation Vs. Current Anti-Fog strategies To Maximize Time-To-Fog & optical Properties On Medical Lenses

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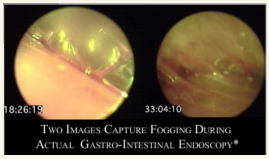

Fig. 1 *Depicts a side-by-side comparison of fogging on endoscopes during a gastrointestinal endoscopy*

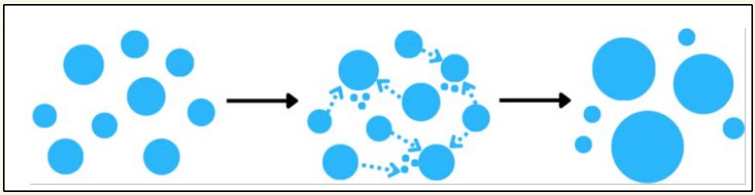

Fig. 2 *Ostwald ripening describes the process of smaller water droplets on a surface getting absorbed due to their high surface energy by larger droplets which creates fewer, but larger particles with a lower surface energy to form. This phenomenon occurs in hydrophobic surfaces*.*

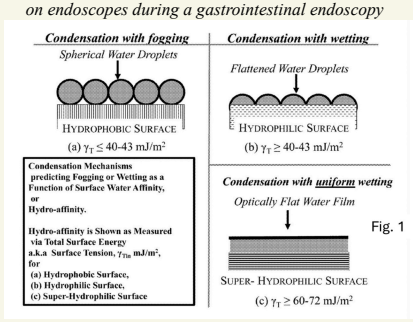

Fig. 3 *Depicts how surface energy affects condensation of water droplets on a film (a) Hydrophobic surfaces have the lowest surface energy thus the lowest affinity for water molecules causing them to form as spherical droplets. This leaves many air pockets between the droplets that cause fogging as well as space for light refraction which distorts vision through a hydrophobic surface. (b) Hydrophilic surfaces have a higher surface energy and thus a higher affinity for water molecules. This causes droplets to adhere flatly to the surface but still create optical distortion through the film. (c) Super-hydrophilic surfaces have the highest surface energy and thus the highest affinity for water molecules. This causes water to form a flat film of water that allows for undistorted visibility.*

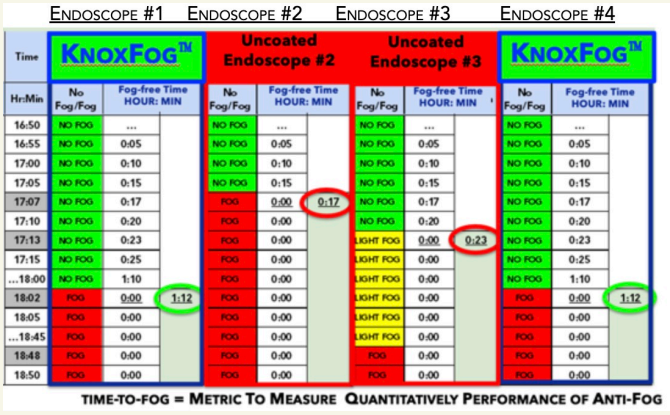

Fig. 5 *Depicts the Time-to-Fog of KnoxFog as a wet hyper-hydrophilic coating versus uncoated endoscopes. Uncoated ensconced #2 and #3 fog after 17-23 minutes at 38 degrees Celsius while endoscopes #1 and #4 coated with wet coated KnoxFog remain fog-free for around 1 hour and 12 seconds in the hot water bath.*

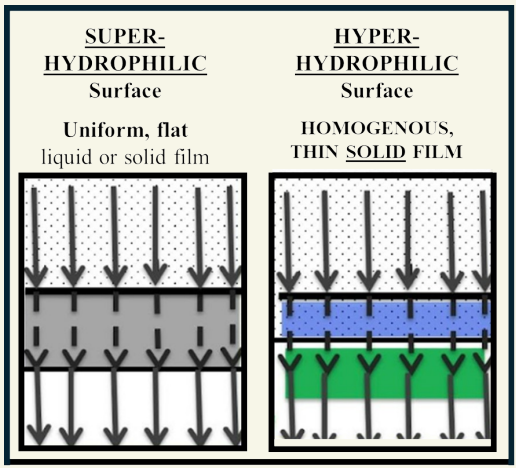

Fig. 4 *Illustrates the difference between water condensation on super-hydrophilic surfaces and hyper-hydrophilic surfaces. In the new hyper-hydrophilic surfaces, water is absorbed by the coating allowing the surface to collect more water during condensation without dissolution of the coating.*

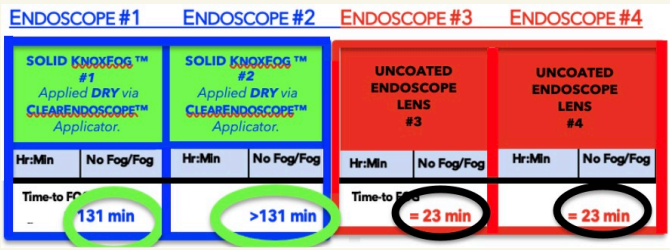

Fig. 6 *Depicts the Time-to-Fog of KnoxFog as a dry coating versus uncoated endoscopes. Uncoated endoscopes #3 and #4 fogged after 23 minutes at 38 degrees Celsius while endoscopes #1 and #2 remained fog free for around 2 hours and 11 minutes in the hot water bath.*

*Herbots, *et al.* 'Super-Hydrophilic, Bio-compatible…' MRS *Advances* **1**, 2141-2146 (2016). https://doi.org/10.1557/adv.2016.474