

# Letter to the Editor Concerning “Historical Development, Applications and Advances in Materials Used in Spectacle Lenses and Contact Lenses” [Letter]

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## Dear editor

This review on historical developments and advances in spectacle lens and contact lens materials was read with great interest and the authors are to be thanked for encompassing the past, present and possible future materials and their unique coatings.<sup>1</sup> In the interest of thoroughness, we would like to add a few fascinating developing materials and coatings for contact lenses in research that were not mentioned.

## Graphene Oxide Coating

Contact lenses with information technology are being developed primarily in the health sector to diagnose disease or monitor physiological information and are a place where chemistry, biology and physics merge. A research group has been studying the qualities of graphene oxide and its behavior when coating a soft contact lens.<sup>2</sup> Graphene oxide is an atomically thin material with outstanding electrical and mechanical properties that has been exhibiting biocompatibility as well.<sup>2</sup> In addition to absorbing electromagnetic energy which can promote ocular health and its potential to be a platform to monitor physiological response, this layer has displayed combination with hydrophilic materials to have a synergistic effect and it is capable of protecting the contact lens from dehydration which would directly benefit patient comfort.<sup>2</sup>

## Mucin Coating

Both the tear film and contact lens materials have incompatible hydrophilic and hydrophobic elements that must cooperate for ocular health and comfort. The bridging element between these conflicting but equally important components is mucin.<sup>3</sup> A high coefficient of friction has been acknowledged as a factor contributing to contact lens discomfort. One research group is developing a transparent layer of mucin macromolecules which firmly adheres to the surface of pure silicone lenses, creating a hydrophilic surface and enhancing wettability.<sup>3</sup> Pure silicone materials are currently unsuitable as materials for contact lenses because of their extreme hydrophobic characteristics but this new found compatibility would open opportunities to enhance oxygen permeability beyond the prevailing silicone

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hydrogel materials. Studies are being conducted to find compatibility for use on commercial contact lenses.<sup>3</sup>

## ZnO Nanoparticles Coating

A third approach is focused on another considerable risk of contact lens wear, microbial keratitis. Many formulations of materials of antimicrobial coatings are being developed as well as methods of adherence to lenses. One copolymer addresses ocular dryness and presents a multifunctional biocompatible network creating a surface coating out of copper ions and poly(carboxyl betaine-co-dopamine methacrylamide) copolymer (PCBDA) which exhibited both hydrating and antimicrobial properties.<sup>4</sup> It increased wettability and reduced protein binding on contact lenses.<sup>4</sup> Another report of a sonochemical coating for contact lenses that is composed of ZnO nanoparticles which provide antimicrobial properties, including Gallic acid which emits antioxidant properties and Chitosan which enhances contact lens surface wettability.<sup>5</sup>

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