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Editorial: theme issue on coronavirus and surfaces

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Introduction

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One contribution of 7 to a theme issue 'Coronavirus and surfaces'.

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Since the publication of the headline review on 'Surface interactions and viability of coronaviruses' in *Journal of the Royal Society Interface* in January 2021 (https://doi.org/10.1098/rsif.2020.0798), it has been my earnest desire to focus the minds of the scientific community on the role played by surfaces in the spread of COVID-19, especially the input physical sciences and engineering can impart to decelerate the spread of this disease worldwide. In fact, fig. 4 of the above-mentioned review clearly illustrated how persistence and viability of different coronavirus strains were dependent on widely used material surfaces. I thought the best way to achieve this goal on this rather complex and novel scientific issue was to put together a concise theme issue in *Interface Focus* where we bring together the opinions of a few internationally leading researchers on this important topic to collectively reduce the burden of COVID-19. Coronavirus and surfaces, the theme of this issue, is of utmost importance to many commercially significant industries such as packaging, textiles and metal forming. As the virus mutates and alters its anchoring and survival capabilities, this theme on coronavirus and surfaces will become more important, so we need to focus on this theme scientifically and methodically, with utmost urgency.

The paper by Morgulchick *et al.* [1] reminds us of the very serious nature of COVID-19. It illustrates how patients with pre-diagnosed conditions admitted to hospital can develop complications leading to mortality due to acute respiratory distress syndrome which is associated with a cytokine storm caused by elevated levels of circulating cytokines leading to infections. They elucidate how targeting various pro-inflammatory cytokines can result in successful therapy with minimal host collateral damage. In their paper, Kosmidis-Papadimitriou *et al.* [2] focus on respiratory droplets which often deposit on widely used surfaces. They consider key substrate types including those made from glass, PTFE, stainless steel and different polymers, and show that droplets can evaporate in less than 3 s leaving the virus exposed! They use a plethora of advanced characterization techniques and nanomechanical measurements to define morphologies and surface adhesion of the droplets and recommend antiviral surface strategies to modulate the evaporation, thus mitigating possible surface viability and transmissibility of coronavirus.

The theme issue papers then focus on surface specifics. A key question is the role played by porosity. Owen *et al.* [3] review current research on porous surfaces in relation to their potential as fomites of coronaviruses. A key finding is that coronaviruses are often less stable on porous surfaces than non-porous surfaces. Textiles are rightly the focus of attention and unfortunately surface properties of textiles differ widely leading to variation in the stability of coronaviruses, with longer persistence on more hydrophobic materials such as polyester compared to highly absorbent cotton. The review uncovers vital factors that need be closely considered when evaluating the role played by textiles and COVID-19 transmission. Non-woven surfaces are studied by Patil *et al.* [4], who consider a 4-ply functionalized non-woven face mask which consists of inner and outer polypropylene layers blocking the passage of large aerosol particles and contains in between polyester non-woven nanofibre filter preventing the passage of smaller aerosol droplets of a few micrometres in size. It is noteworthy that polylactic acid polymer and herbal immune-boosting

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phytochemicals are spray-coated on these masks to functionalize performance. However, these functionalized non-woven masks have still to be specifically tested against coronavirus and the fact that they contain a high content of polymeric materials may be questionable in an environmental mass usage context. Tharayil *et al.* [5] study the risk factors involved in the indirect transmission pathways of SARS-CoV-2 strains on fomites. They conclude that the main mode of indirect transmission originates from the contamination of the porous and non-porous inanimate surfaces and include key types, clothes and PPE in their analysis. A striking feature of this paper is the discussion on materials and forming processes that can actively reduce SARS-CoV-2 surface contamination patterns and their associated transmission routes.

Last but not least, Butnariu *et al.* [6] focus their paper on the crucial surface–cell interactions. Binding, fusion and the conformational changes of the critical spike protein to host cell surface receptors are evaluated. These surface interactions hold the key to successful antiviral therapies. The authors also generate insight into novel therapies that target viral non-structural proteins. Scientific understanding at molecular level at the cell surface is crucial for these more efficacious and targeted therapies.

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Competing interests. I declare I have no competing interests.

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