A green and refillable antibacterial coating for stainless steel.

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Because of its resistance to corrosion and chemicals, relevant mechanical and esthetical properties, stainless steel (SS) is widely used in the daily life (food industry, household appliances, surgery …). However, SS is unable to prevent bacteria from adhering, proliferating and forming a resistant biofilm when ageing. Therefore, surface modification is needed for providing durable antibacterial properties.
We report here on an all-in-one approach to prepare refillable antimicrobial films [1] using the layer-by-layer deposition of polyelectrolytes. Specifically designed biocidal multilayered polyelectrolyte films that bear 3,4-dihydroxyphenylalanine (DOPA), known as a promoter of adhesion to inorganic surfaces, were deposited onto SS. DOPA was incorporated in the polycationic chains by radical copolymerisation of *N*-methacrylated DOPA with the quaternary ammonium salt of 2-(dimethylamino)ethyl methacrylate ($DMAEMA^+$). In order to boost the antibacterial activity of the polycationic layer, $AgNO_3$ was added to the aqueous solution of P(DOPA)-*co*-P($DMAEMA^+$), which resulted in the in-situ formation of silver based nanoparticles, sources of biocial Ag^+. The layer-by-layer deposition of aqueous P(DOPA)-*co*-P($DMAEMA^+$)/AgCl/Ag^0 suspension and aqueous solution of poly(styrene sulfonate) provides high antibacterial activity against Gram-negative *E. Coli* bacteria. Moreover, after silver depletion, films retain some antimicrobial activity, thanks to ammonium groups of the copolymer. We also show that the antibacterial activity of the films can then be easily re-boosted.[1]

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