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# Advances in structural coloration induced by integrated hierarchical surface structures fabricated by elliptical vibration texturing

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With applications for functional decoration and anti-counterfeiting, the technique of manufacturing surface micro-/nano- structures to colorize metal surfaces by using elliptical vibrating cutting (EVC) has been continuously developed and has been applied to some more advanced applications, such as basso-reliefs, optical variable devices, and autostereoscopic images. To achieve the desired optical performance, the gratings in variable spacings are integrated on specially designed substrate surface structures, forming a hierarchical surface structure. The tailored hierarchical surface structures provide hybrid optics with outstanding performance in their individual application scenarios. In this study, with three examples from our previous study, the fabrication of desired hierarchical surface structures and corresponding optical performance are presented with a generic simulation scheme that unifies the surface generation and diffraction. The simulation is further compared with our experimental results correspondingly to provide an intuitive view of how the tailored hierarchical structure provides structural coloration with variable optical functions.