

Modelling reflectance spectra for special effect pigment coatings

Nina Rogelj, Marta Klanjšek Gunde



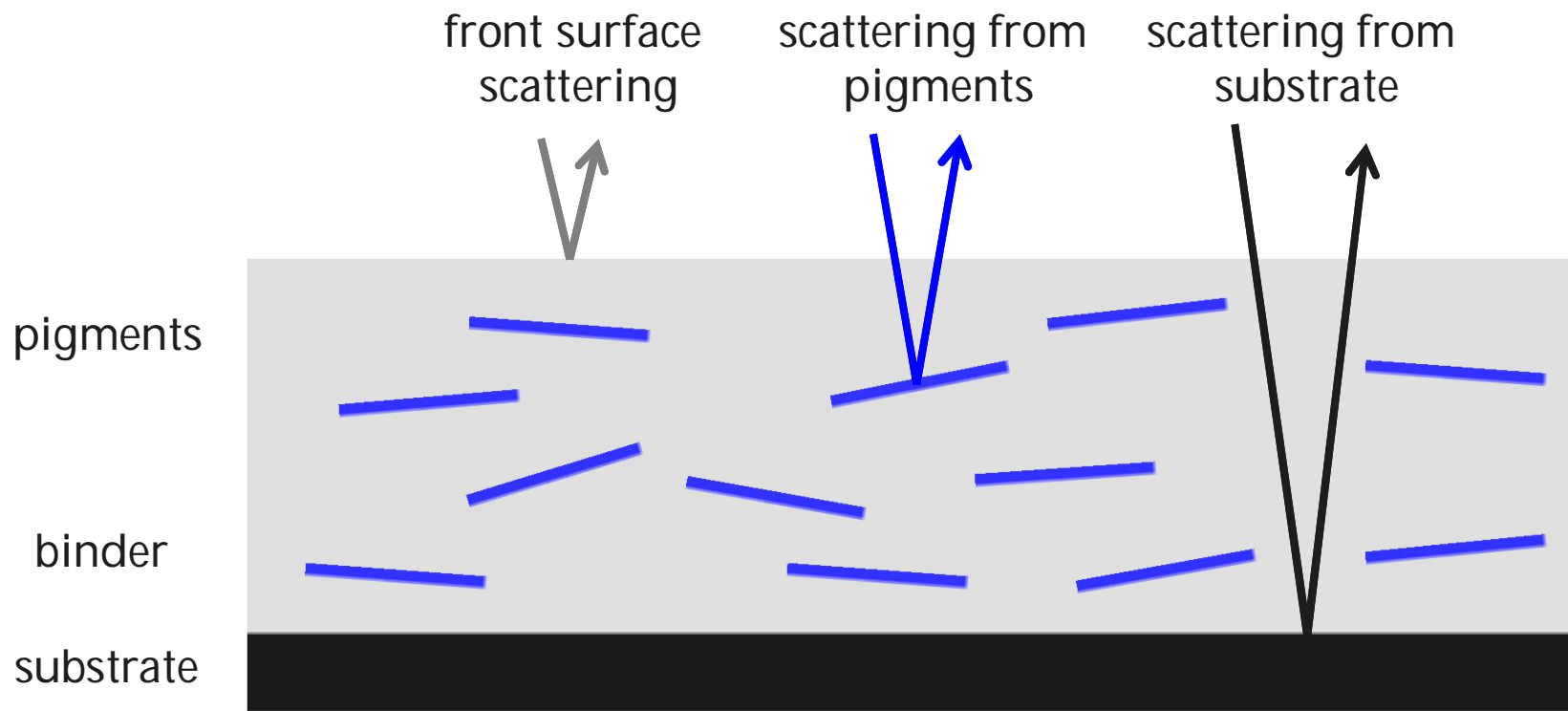
Gonioapparent samples
are becoming increasingly important.



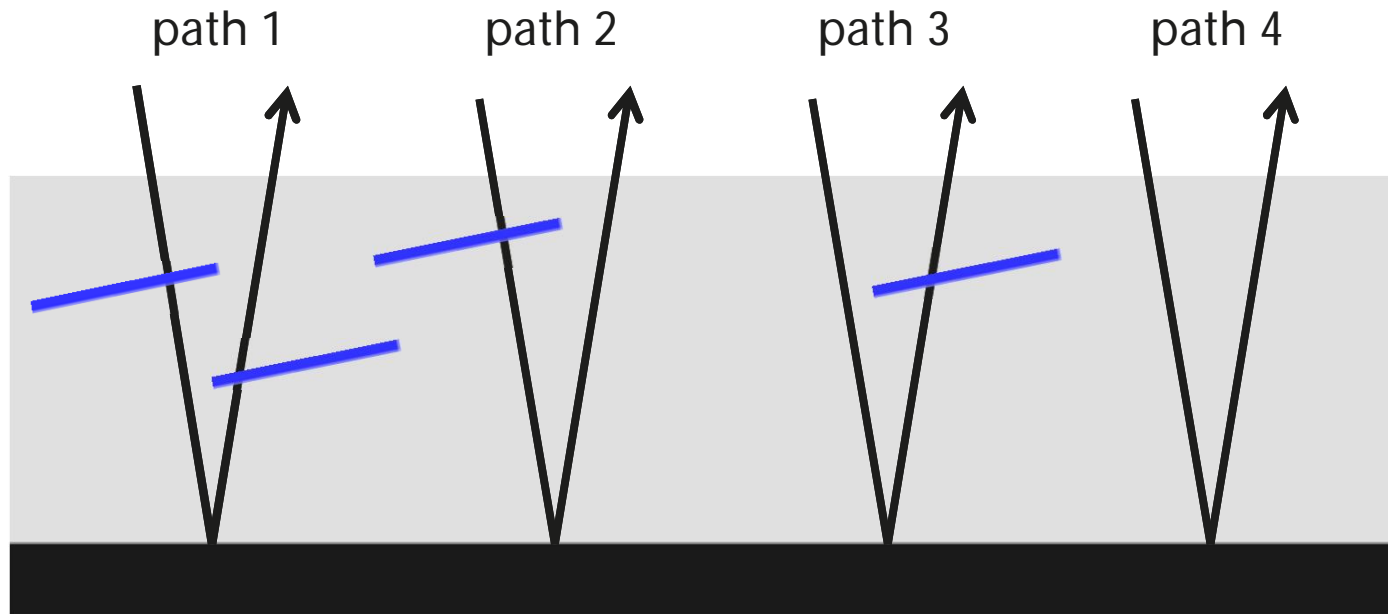
http://www.autospeed.co.nz/cms/A_110579/article.html

www.alibaba.com

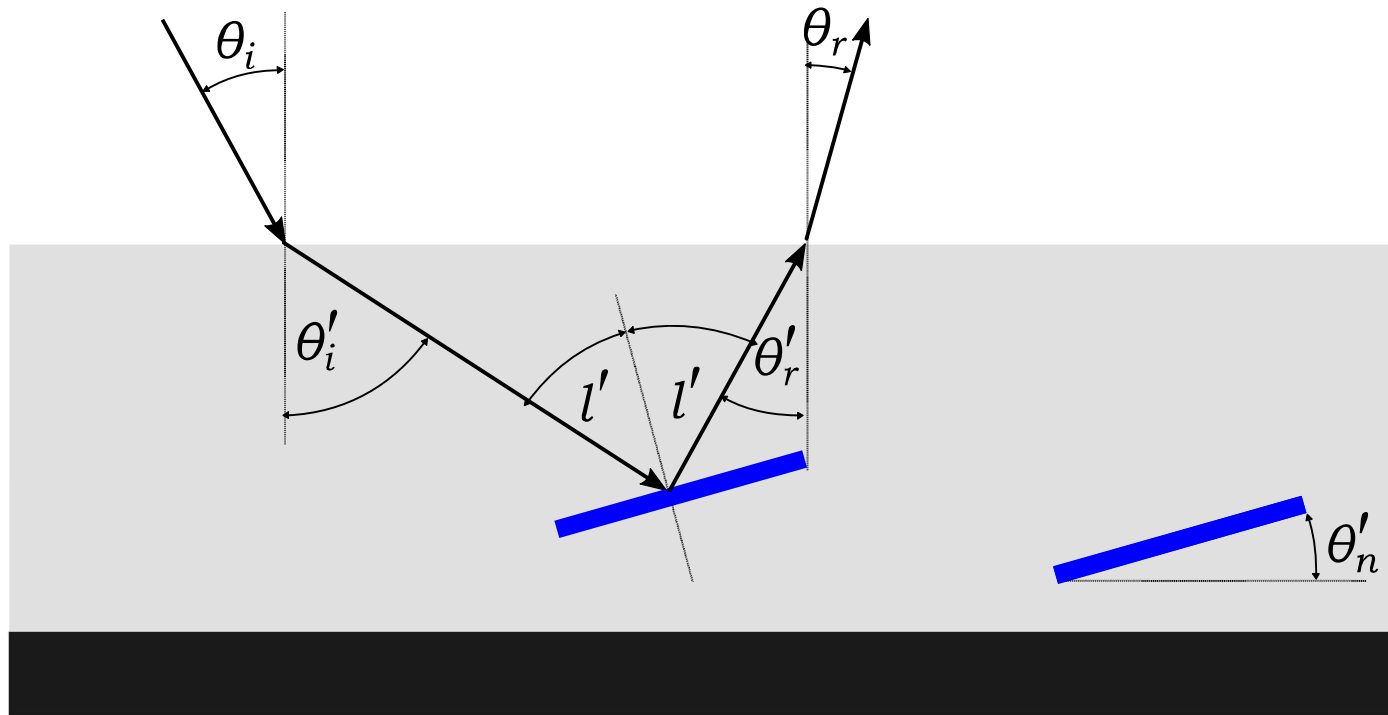
The model incorporates 3 contributing parts of scattering.



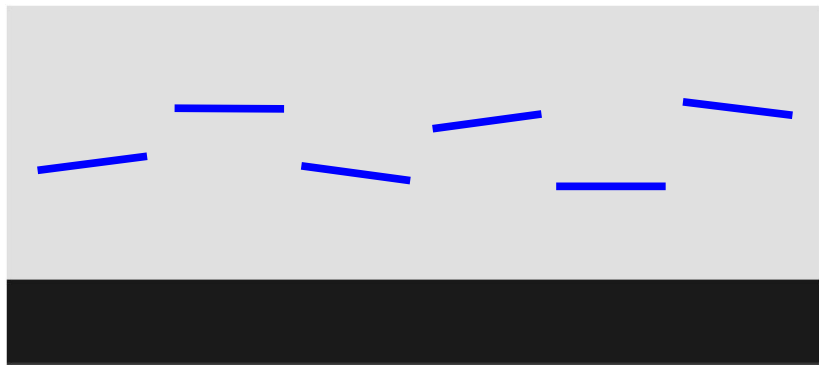
Light can follow 4 different paths when undergoing scattering from the substrate.



Scattering from effect pigments is taken as specular reflection from aligned facets.



Orientation spread around mean flake tilt angle is given as standard deviation σ' .



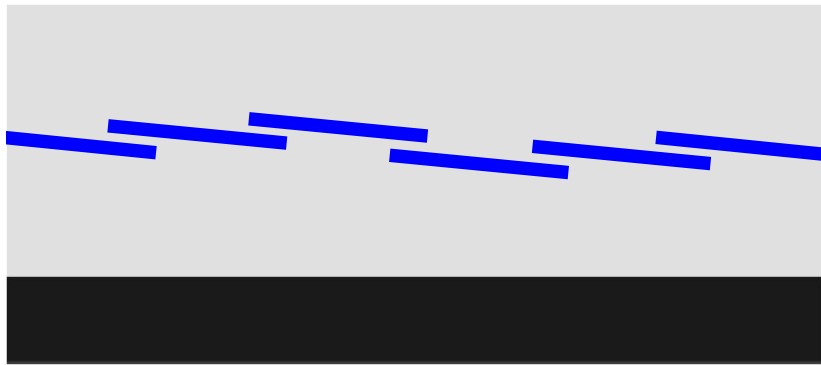
σ' small



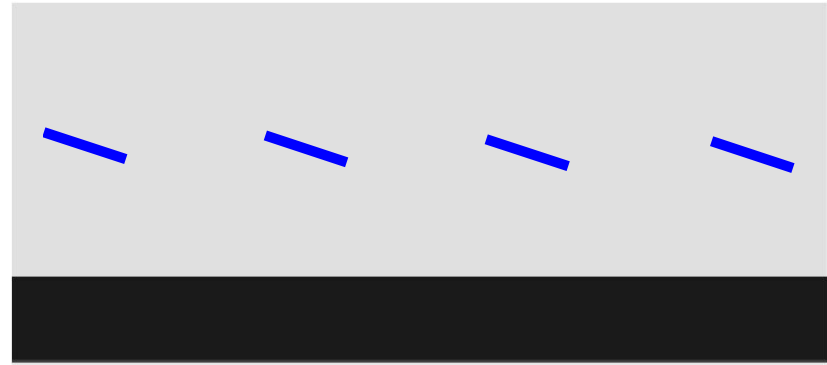
σ' large



Parameter C contains pigments size and volume concentration.

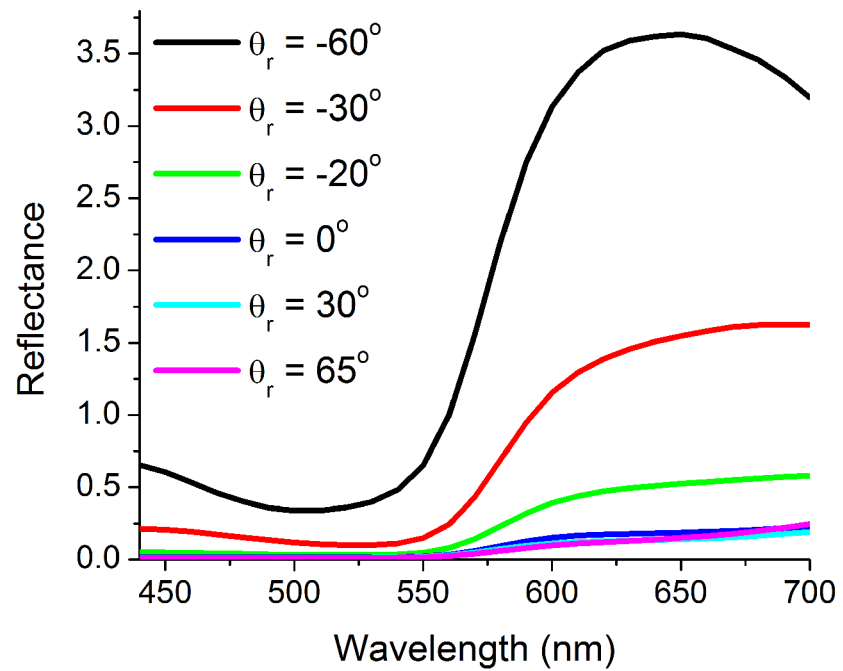
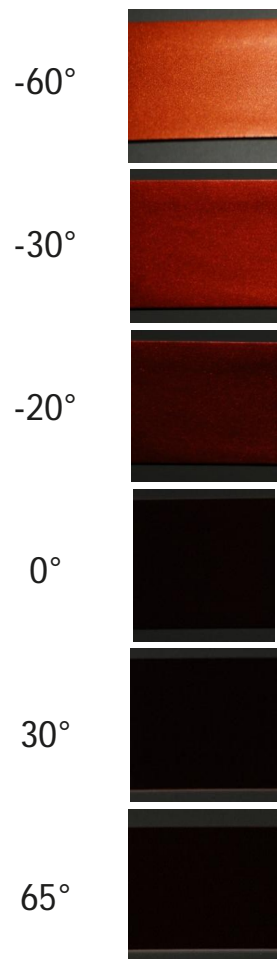


C large

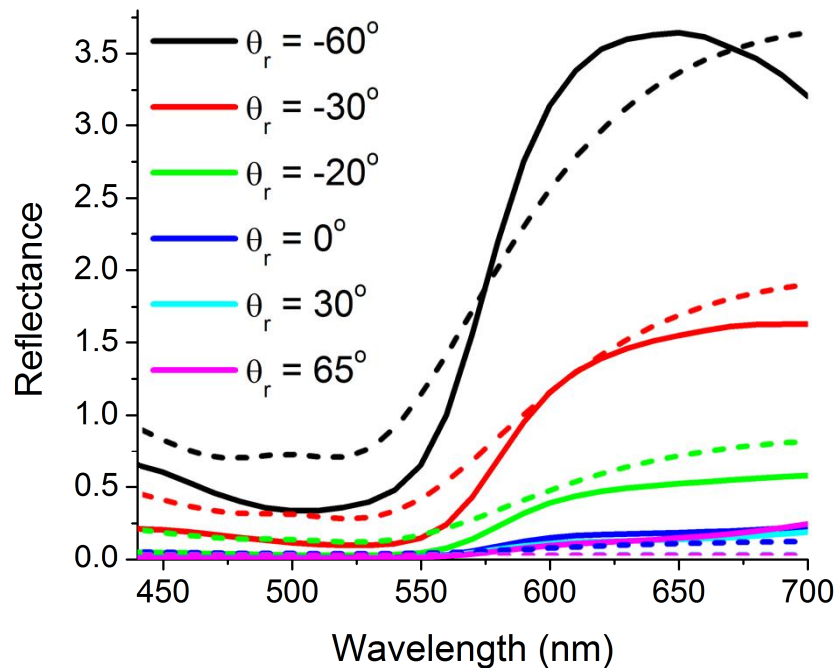


C small

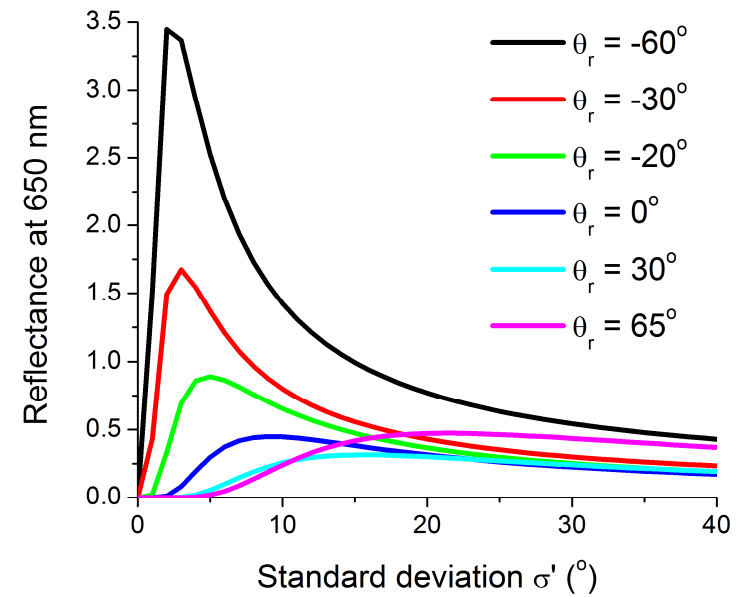
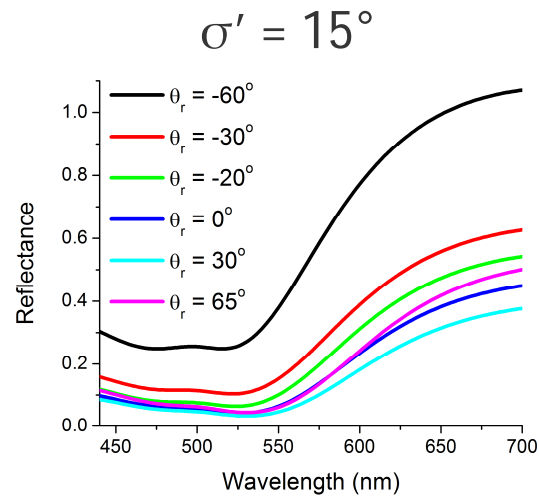
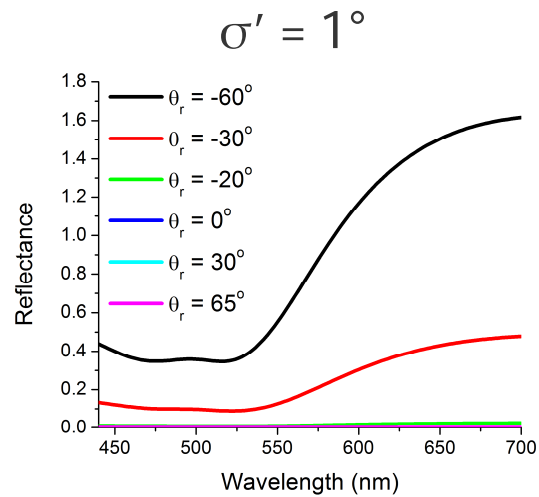




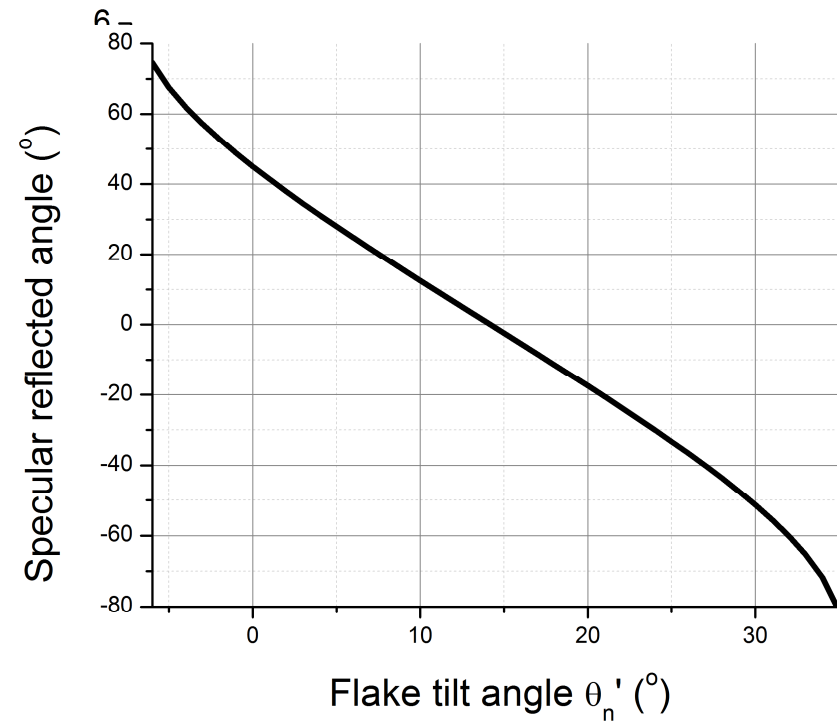
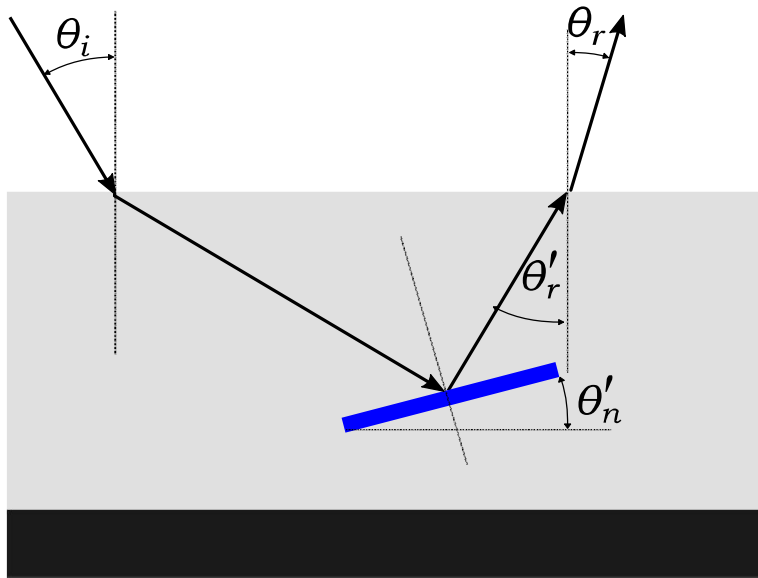
Model fits well the measured reflectance spectra.



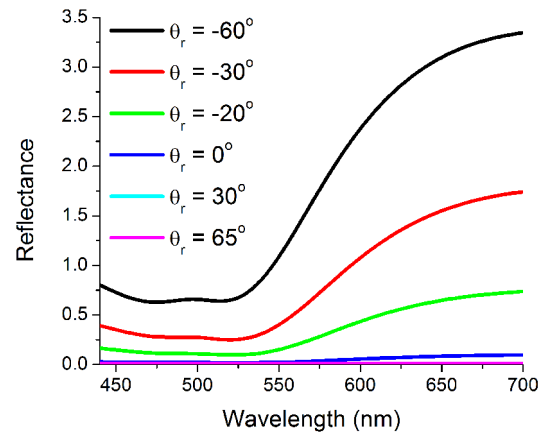
Influence of orientation's standard deviation



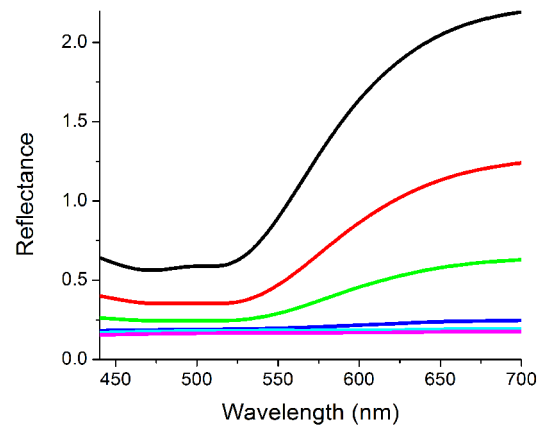
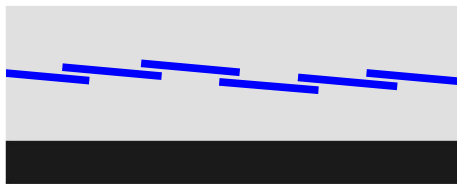
Influence of mean flake tilt angle



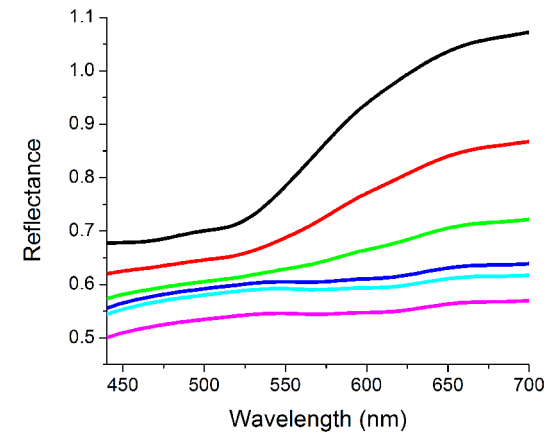
Smaller surface coverage, C , gives stronger substrate influence.



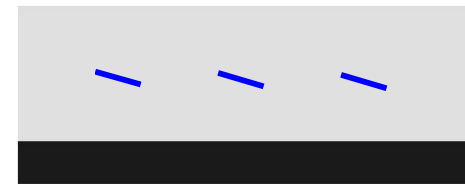
$C = 0.9$



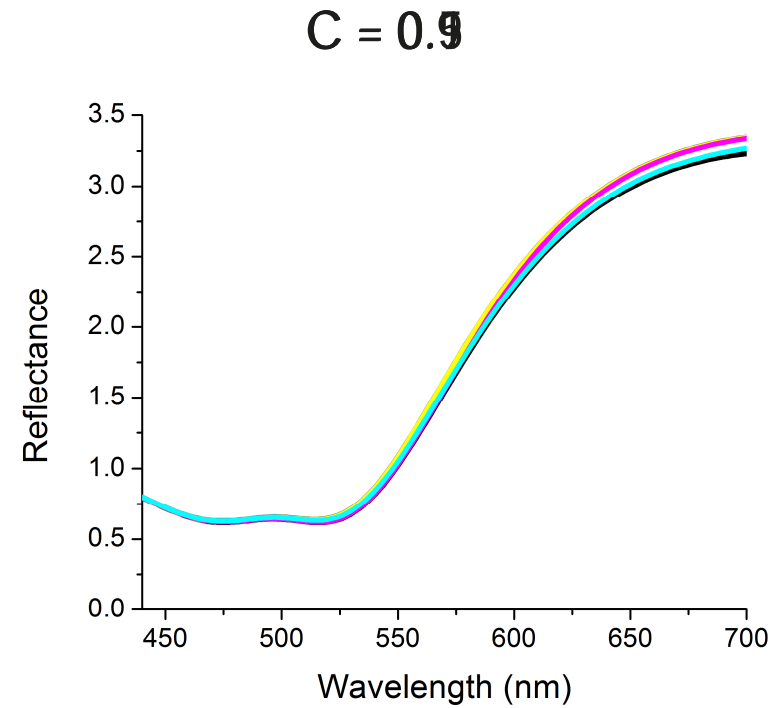
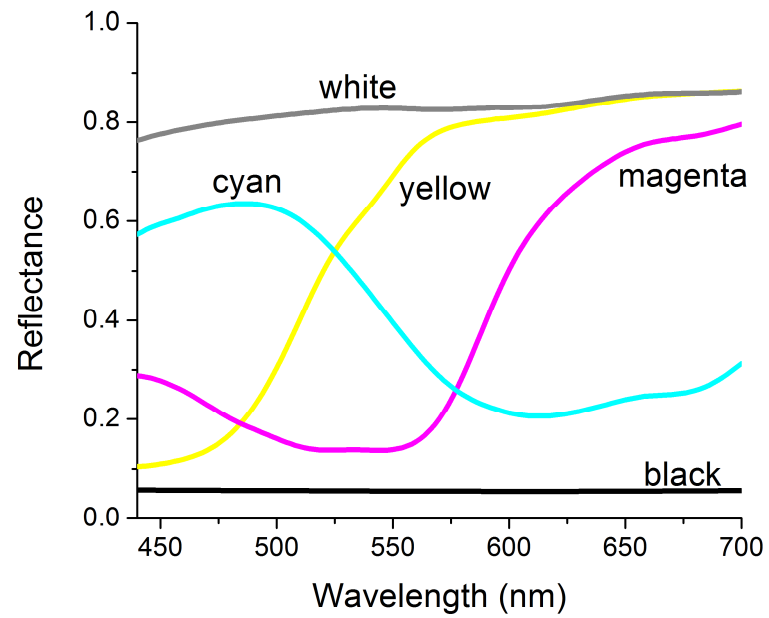
$C = 0.5$



$C = 0.1$

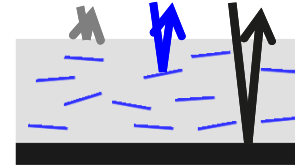


Influence of the substrate

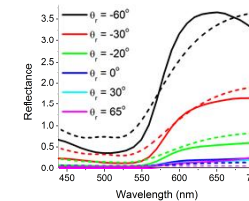


In conclusion

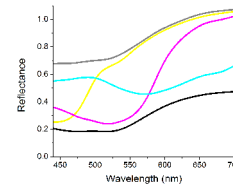
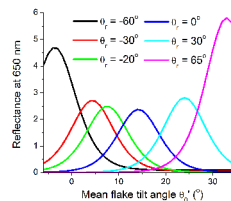
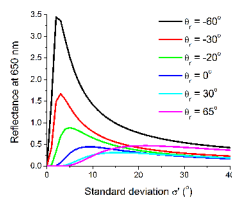
○ Model incorporates 3 scattering parts.



○ Model fits well the measured spectra.



○ The influence of surface coverage, pigment orientation distribution and coating substrate on goniometric reflectance was analysed.



nina.rogelj@uef.fi



CIE76 colour difference and RMSE between measured and modelled reflectance values.

aspecular angle	CIE76	RMSE
-60°	20.58	0.3543
-30°	14.76	0.1702
-20°	12.32	0.1245
0°	17.64	0.0741
30°	26.29	0.0952
65°	26.27	0.1077



Numerical model

$$S = (F^{facet} G + F^{flake} G + F^{base}) S_0$$

$$F^{model} = \frac{P}{4 \cos \theta_i \cos \theta_r \cos \theta_n} M^{model}$$
