

Reflectance of dental materials after staining: A Comparative Study

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Introduction:

Like an unique smile, a beautiful smile is the one that suits an individual's appearance and character, in order to make it perfectly natural.¹ This demand for perfection has led to a great development in the last two decades. As such, current composite resins can achieve a high performance due to their aesthetic potential, acceptable longevity and relative low cost.²

Currently, there has been an increase on the interest of tooth discoloration and pigmentation, as we can observe by the great number of teeth bleaching products available in the market. Tooth discoloration is due to physiological changes, extrinsic pigment incorporation and gradual enamel weariness. On the other hand, composite resin discoloration is mostly caused by extrinsic pigment incorporation.³

Objective:

To evaluate *in vitro*, the color staining susceptibility of eight popular composite resins used in general practice, after immersion in staining solutions.

Materials and methods:

32 specimens (12mm in diameter, 2mm in thickness) of eight popular light-cured composite resins were prepared. Filtek™ Z250 (FZ250), Filtek™ Silorane (FS) and the Filtek™ Supreme XTE system (enamel: FXTEE, dentin: FXTED, body: FXTEB) from 3M-ESPE (Minnesota, USA); Enamel HRI™ system (enamel: EHRiE, dentin: EHRiD) from Micerium S.p.A (Avegno, Italy) and Durafill VS (DVS) from Heraeus Kulzer (Hanau, Germany). All specimens were then immersed in distilled water (control-group), red wine (Quinta dos Ganhões – Alentejo, Portugal), espresso coffee (Nespresso “Roma” blend - Nestlé, Switzerland) and black label tea (Lipton Yellow Label Tea - Lipton, France), for a period of 72 hours and kept in an incubator at 37°C. Reflectances in the UV-Vis-NIR spectral range and also the remission function (plotted in terms of F(R) – Kubelka-Munk equation⁴) were measured by a spectrophotometer (equipped with a ICCD Andor optical sensor model i-Star 720 and a 450W Xenon lamp) through ground-state diffuse reflectance absorption spectra.

Results:

All dental materials immersed in staining solutions presented a generalized increase on their remission function (Fig. 1 – 12). The highest remission variation was observed for EHRiE with espresso coffee (Fig. 4), while the lowest variation was observed for FS with black label tea (Fig. 2). Red wine proved to have the highest staining potential for all resins followed by espresso coffee. Black label tea showed the lowest staining potential.

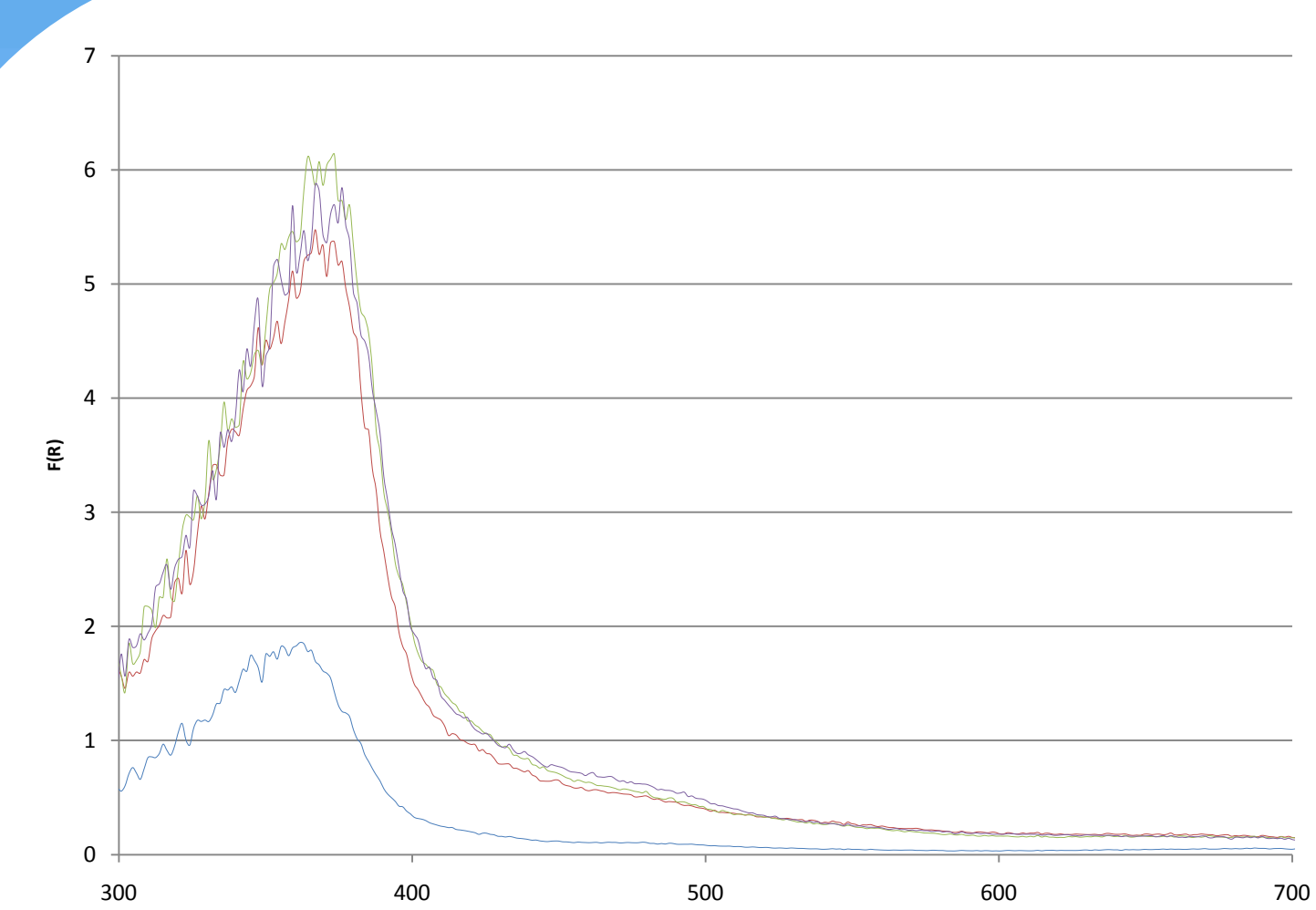


Figure 1 - Remission function of FZ250

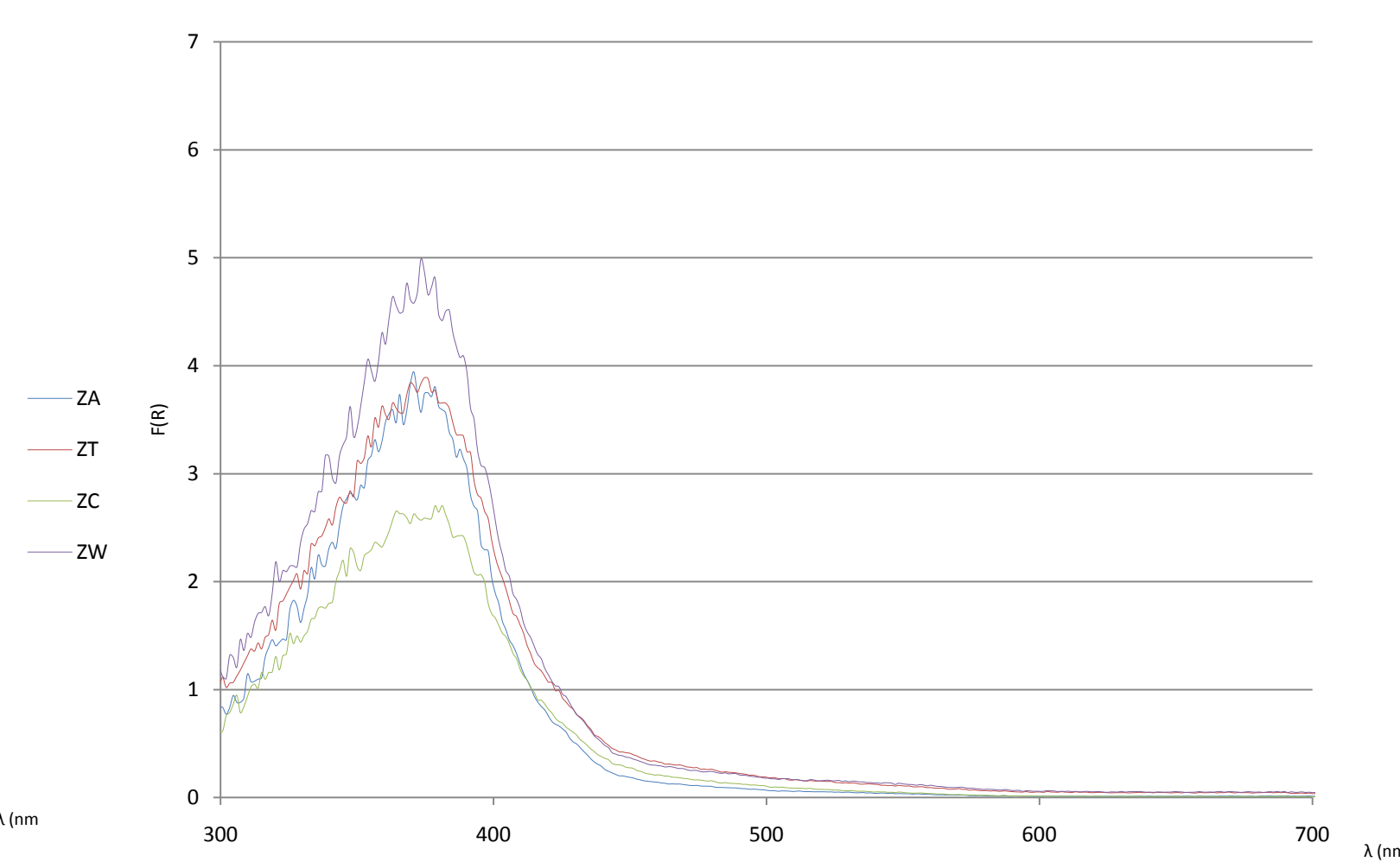


Figure 2 - Remission function of FS

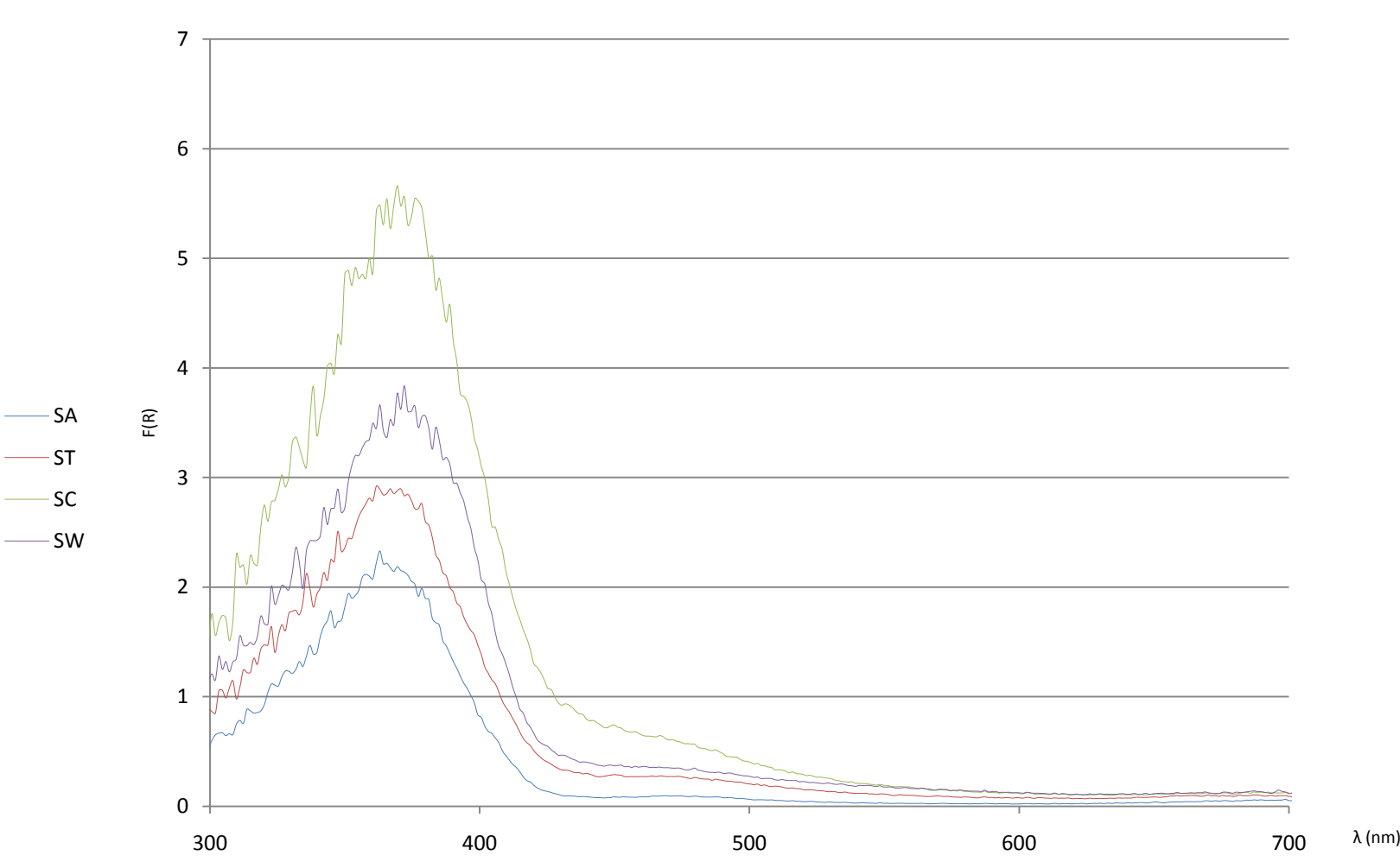


Figure 3 - Remission function of DVS

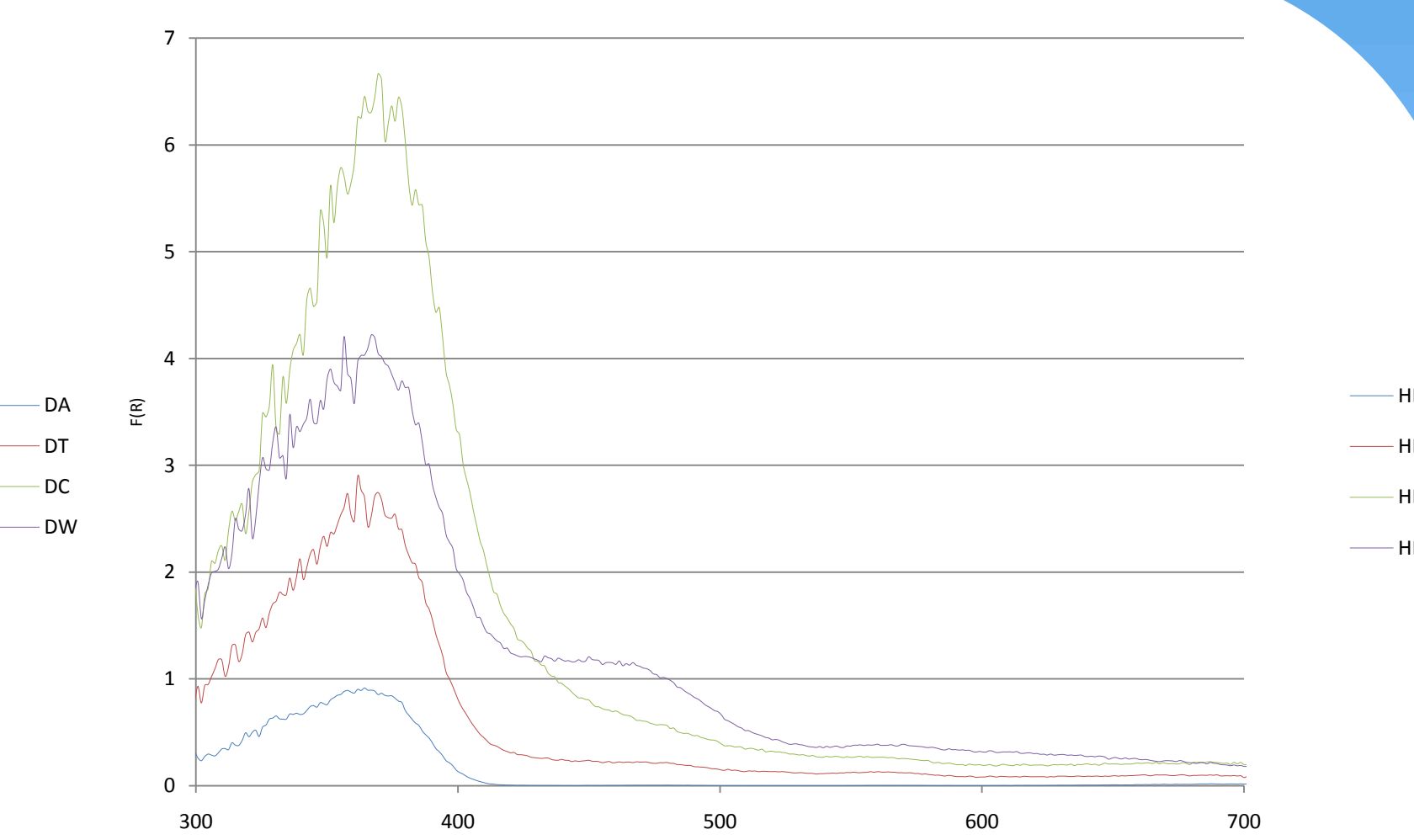


Figure 4 - Remission function of EHRiE

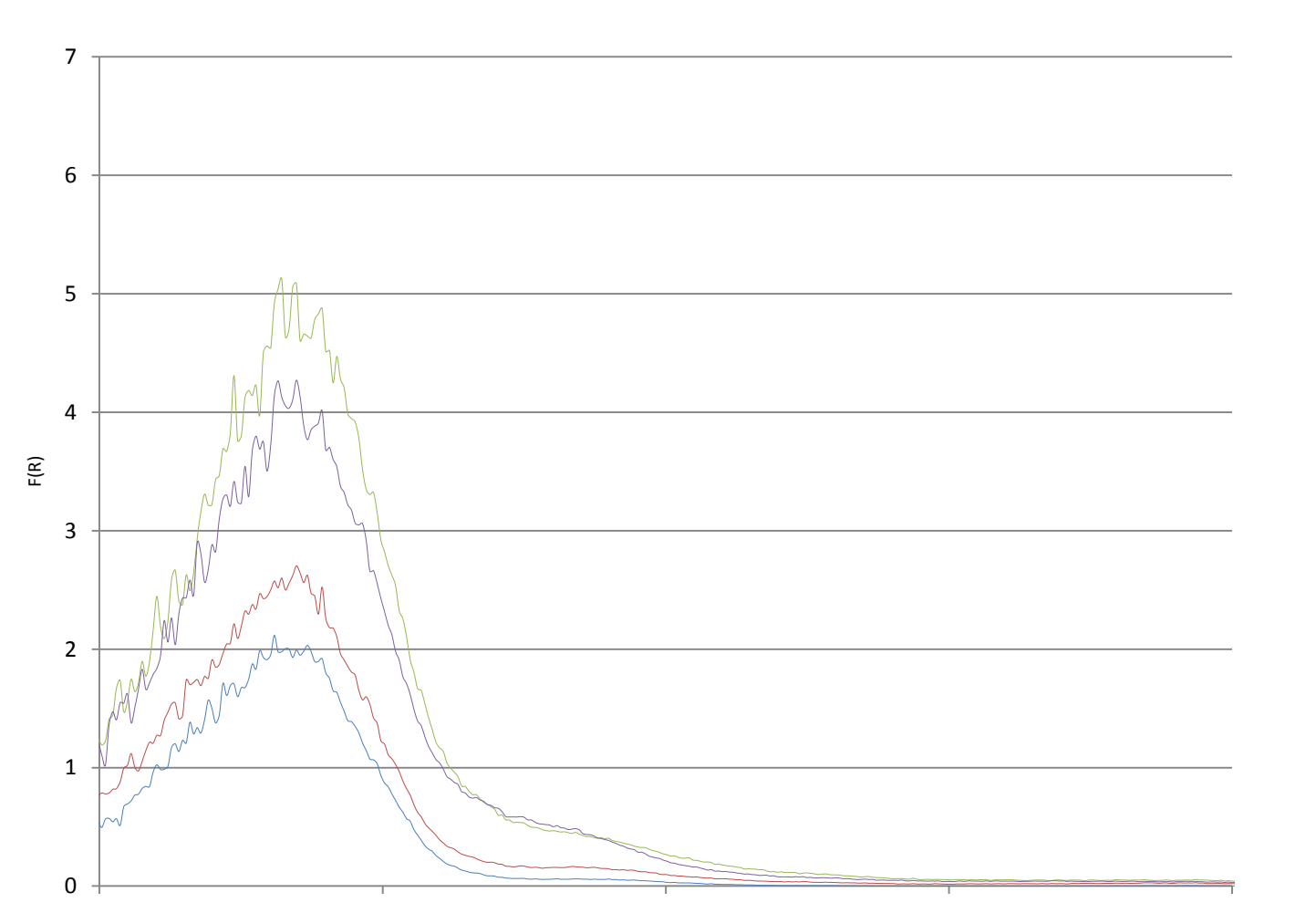


Figure 5 - Remission function of EHRiD

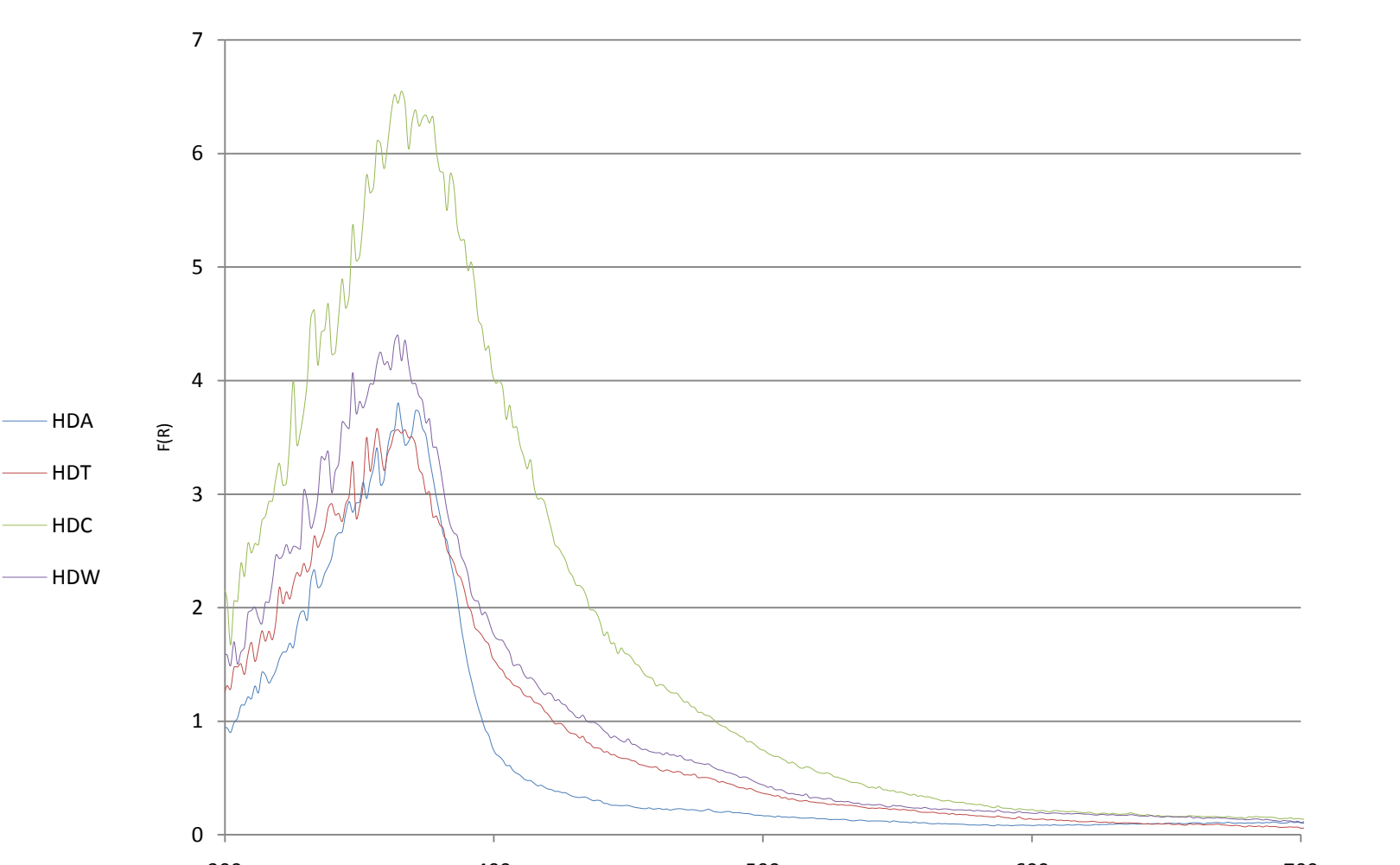


Figure 6 - Remission function of FXTEE

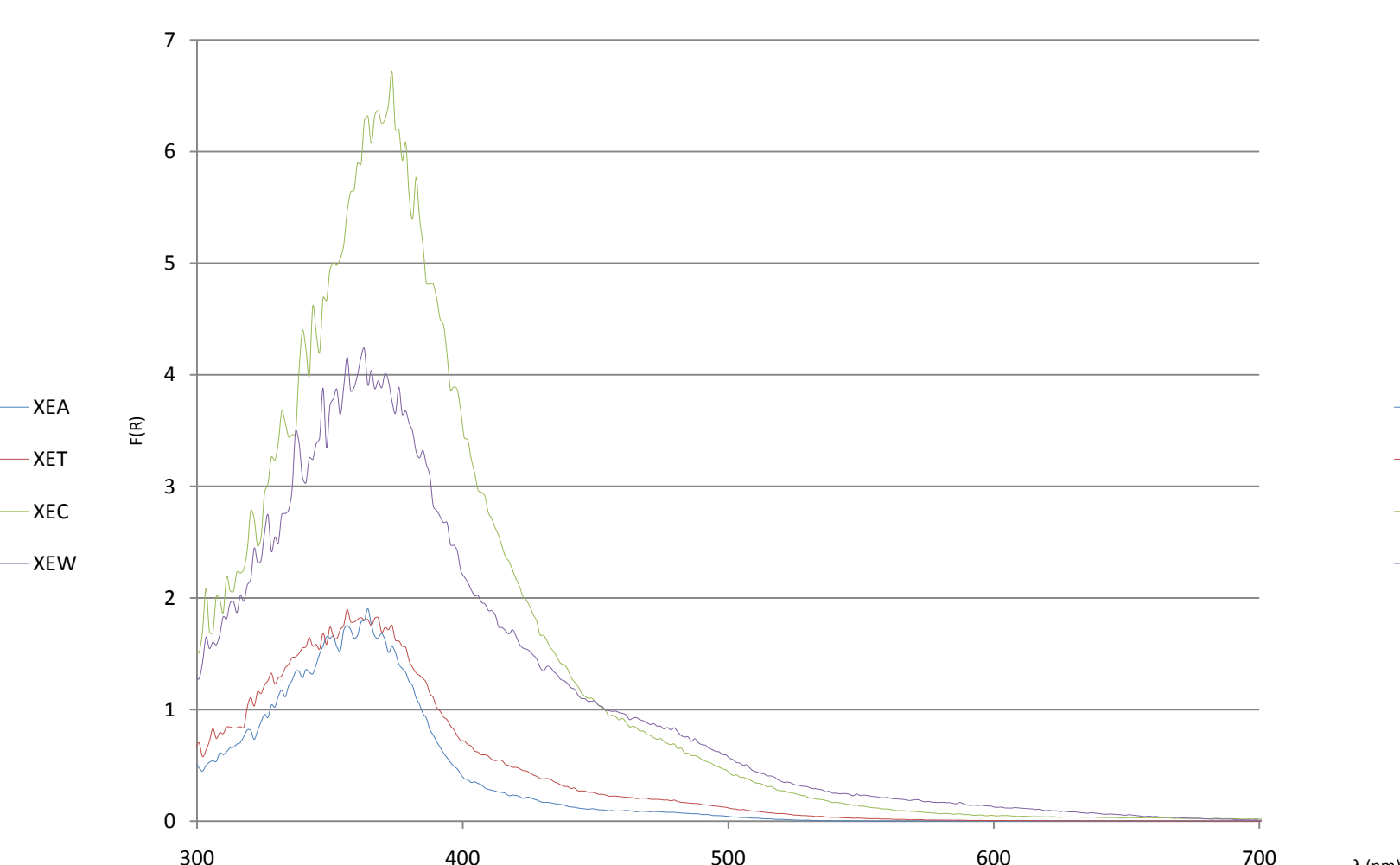


Figure 7 - Remission function of FXTED

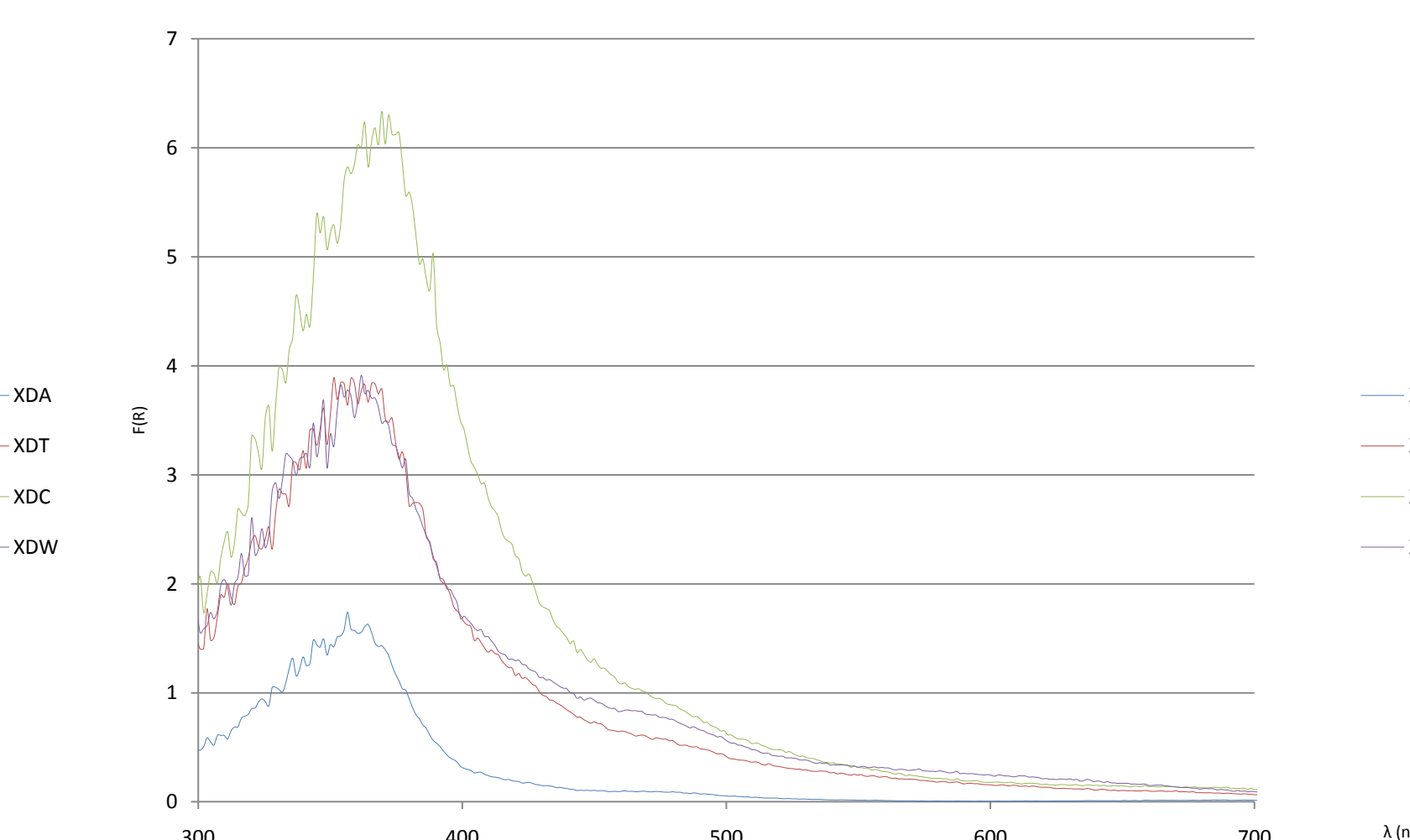


Figure 8 - Remission function of FXTEB

Discussion

- Considering that a restorative composite resin system to be used with a stratification technique should be preferably more color stable in its most outer layer (enamel-like resin), in this study, it was observed that Filtek™ Supreme XTE system presented a very good color stability for its enamel-like resin (FXTEE) but was more susceptible to be pigmented by coffee; Enamel HRI™ system showed a higher susceptibility to be pigmented by coffee and wine.
- A visual analysis of the samples shows that the most pigmented areas are located on the peripheral edge, probably due to the minor capability of packing and greater roughness of the area.
- Filtek™ Silorane showed a great color stability despite being a composite resin for posterior teeth restorations. Two possible reasons are the low polymerization shrinkage, which leads to a minor incorporation of the pigment and the hydrophobic behavior of the resin matrix.^{5,6}
- Generally, the increase of composite resin's inorganic filler volume percentage seems to lead to an increase of the color stability.
- There are only a two articles in the literature applying the same methodology as presented in this study. They also verified an increase on the Remission Function for all specimens.^{7,8}

Conclusions

All the resin composites in this study were susceptible to pigmentation, with some variation depending on the constituent monomers, the volume percentage of inorganic filler and the staining solutions.

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Acknowledgments

The authors gratefully acknowledge: 3M-ESPE™, Micerium S.p.A™ and Heraeus Kulzer™ for supplying the materials used in this study