EVALUATION OF INFLUENCES OF INTERFACE BETWEEN MATRIX AND INCLUSION BY FFT

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In order to take into account the effects of interface between matrix and inclusion, an interphase is generated. A numerical homogenization process is considerated, based on multiscale technique to estimate the effective properties of composite structures with the Lippmann-Schwinger equations. The algorithm is based on fast Fourier transform (FFT) which is more convenient and efficient. However, considering an interphase poses problems for FFT. As the interphase is very thin and due to inhomogeneities, the kernel (Green-kernel) must be also modified to get more accuracy in calculation[2]. This approach is especially suitable for high and low contrasts, seeing that the number of pixel representing the same material is limited. This limit reduces the accuracy of FFT. In this framework, the paper studies different approaches to overcome the interphase problem. The effective material properties are estimated by using multilayer interphase as well as equivalent interphase in the homogenization procedure.

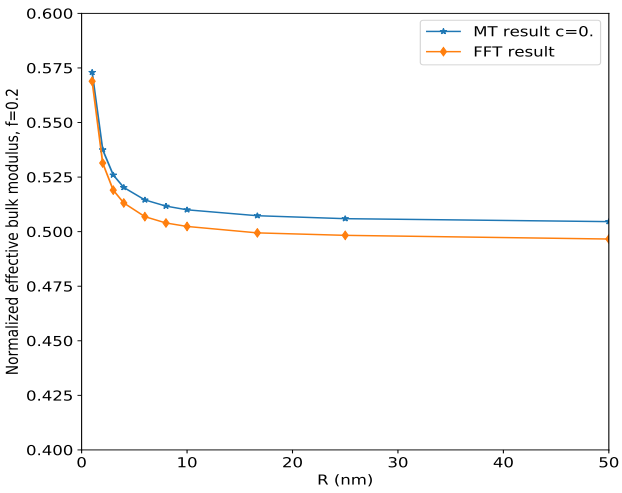

Figure 1. Effect of interphase

where R is the inclusion radius. The figure 1 shows the expected size effect as presented in [1] by FEM. Details and validation of the method, more results will be presented in the full paper.

References

[1] Yvonnet, J., Quang, H. L., and He, Q. C. (2008). An XFEM/level set approach to modelling surface/interface effects and to computing the size-dependent effective properties of nanocomposites. *Computational Mechanics*, 42(1), 119-131.

[2] Willot, F.Fourier-based schemes for computing the mechanical response of composites with accurate local fields. *Comptes Rendues Mecaniques*, 343, 232-245 (2015).