

# *Tikhonov and TV regularizations to retrieve thermal conductivity depth-profiles from infrared thermography data*

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We analyze the ability of the Tikhonov and TV regularization to retrieve different shapes of in-depth thermal conductivity profiles, usually encountered in hardened materials, from surface temperature data. Exponential, oscillating and sigmoidal profiles are studied. By performing theoretical experiments with added uniform white noises, the influence of the order of the Tikhonov functional and of the parameters that need to be tuned to carry out the inversion are investigated. The analysis shows that the Tikhonov regularization is very well suited to reconstruct smooth profiles but fails when the conductivity exhibits steep slopes. We check a natural alternative regularization, the total variation functional, which gives much better results for sigmoidal profiles. Accordingly, a strategy to deal with real data is proposed in which we introduce this total variation regularization. This regularization is applied to the inversion of real data corresponding to a case hardened AISI 1018 steel plate, giving much better anticorrelation of the retrieved conductivity with microindentation test data than the Tikhonov regularization. The results suggest that this is a promising way to improve the reliability of non destructive evaluation methods.

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## REFERENCES

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