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## Notes

## Comprehensive thematic T-matrix reference database: A 2014–2015 update

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## ABSTRACT

The *T*-matrix method is one of the most versatile and efficient direct computer solvers of the macroscopic Maxwell equations and is widely used for the computation of electromagnetic scattering by single and composite particles, discrete random media, and particles in the vicinity of an interface separating two half-spaces with different refractive indices. This paper is the seventh update to the comprehensive thematic database of peer-reviewed *T*-matrix publications initiated by us in 2004 and includes relevant publications that have appeared since 2013. It also lists a number of earlier publications overlooked previously.

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### 1. Introduction

The thematic database of *T*-matrix publications was initiated in 2004 [1] and has been followed by six updates [2–7]. This seventh update lists and classifies 211 new publications [8–218]. The majority of the new entries have appeared since 2014 with the exception of a few older publications omitted inadvertently in [1–7]. The current update is compiled by applying the same four general criteria:

- The database includes only publications dealing with the scattering of macroscopic time-harmonic electromagnetic fields.

- In general, publications on scattering by isolated infinite cylinders and systems of parallel infinite cylinders in unbounded space are excluded.
- Publications on the Lorenz–Mie theory and its various extensions to individual isotropic spherically symmetric scatterers are not covered.
- The database contains only references to books, peer-reviewed book chapters, and peer-reviewed journal papers, while conference abstracts as well as Masters, PhD, and Habilitation dissertations are not covered.

Furthermore, we continue to use the same operational definition of the *T*-matrix method, i.e.,

In the framework of the *T*-matrix method, the incident and scattered time-harmonic electric field vectors are expanded in series of suitable vector spherical wave functions; the relation between the columns of the respective expansion coefficients is established by

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means of a transition matrix (or  $T$  matrix). This concept applies to the entire scatterer or to separate parts of a composite scatterer.

As such, this definition encompasses what is often referred to as the multi-sphere method or the generalized Lorenz–Mie theory.

As before, the inclusion of a publication in our database does not constitute any formal endorsement or quality certification on our part. However, the practical value of this database is enhanced by classifying all references into a set of narrower subject categories. Note that a reference can appear in several subject categories.

As always, we would very much appreciate e-mailing us missing  $T$ -matrix publications as well as information on new books, book chapters, and peer-reviewed journal papers for inclusion in a forthcoming update of this reference database.

## 2. Particles in infinite homogeneous space

### 2.1. Books, reviews, tutorials, and databases

[75,76,97,129,144,149,157,203].

### 2.2. Mathematics of the $T$ -matrix method

[22,116,169].

### 2.3. Extended boundary condition method and its modifications, generalizations, and alternatives

[50,61,62,115,116,161,169,192].

### 2.4. $T$ -matrix theory and computations for anisotropic, chiral, gyrotropic, magnetic, and charged scatterers

[31,37,38,60,80,107,123,124,185,191,192,215].

### 2.5. Multi-sphere and superposition $T$ -matrix methods and their modifications, including related mathematical tools

[79,80,82,110,111,124,129,158,173,198,199].

### 2.6. $T$ -matrix theory and computations of electromagnetic scattering by periodic and aperiodic configurations of particles and photonic crystals

[10,37,38,95,124,198,199,200].

### 2.7. $T$ -matrix theory and computations of electromagnetic scattering by discrete random media and particulate surfaces

[54,79,90,110,111,142].

### 2.8. Relation of the $T$ -matrix method to other theoretical approaches

[60,61,115].

### 2.9. Symmetry properties of the $T$ matrix, analytical ensemble-averaging approaches, and linearization

[97].

### 2.10. Software implementation, parallelization, GPU-acceleration, and customization of $T$ -matrix computer programs

[97].

### 2.11. Convergence of various implementations of the $T$ -matrix method

[50,60,62,115,116,169].

### 2.12. $T$ -matrix calculations for homogeneous spheroids

[8,11,12,15,17,19,22,26–28,31,39,40,42,45–48,50,55–57,63,65,66,68–72,83,85,88,89,92,93,99,101,103,105,107–109,112–114,117,119,120,122,125,134,137,138,140,145,149,156,159,169,175,176,180,182,183,188,189,190,196,209,211,214,218].

### 2.13. $T$ -matrix calculations for Chebyshev and generalized Chebyshev particles

[48,62,65,188].

### 2.14. $T$ -matrix calculations for finite circular cylinders

[16,21,50,72,81,91,148,152,173,188,203].

### 2.15. $T$ -matrix calculations for various rotationally symmetric particles

[22,27,32,148,166,179,215].

### 2.16. $T$ -matrix calculations for ellipsoids, polyhedral scatterers, and other particles lacking axial symmetry

[20,21,22,78,127,192,203,216].

### 2.17. $T$ -matrix calculations for layered and composite particles

[121,204].

### 2.18. $T$ -matrix calculations for clusters of homogeneous and core–mantle spheres

[13,23–25,30,33–35,41,49,51,52,54,58,59,64,73,77,82,86,87,90,95,98,100,107,123,124,126,128,132,133,143,146,150,151,153,154,155,158,162–165,167,168,171,172,177,181,184,186,187,194,195,196,210,217].

### 2.19. $T$ -matrix calculations for clusters of nonspherical, inhomogeneous, and optically active monomers

[25,58,59,174,193].

2.20. *T*-matrix calculations for particles with one or multiple (eccentric) inclusions

[33–35,49,96,141,142,194,195,215].

2.21. *T*-matrix calculations of optical resonances in non-spherical particles and multi-particle clusters

[15,46,48,51,95,100,155,160,167,172,181,211].

2.22. *T*-matrix calculations of optical and photophoretic forces and torques on small particles

[26,43,53,104,131,136,139,144,148,149,152,157,177,201,213].

2.23. *T*-matrix calculations of internal, surface, and local fields and near-field energy exchange

[104].

2.24. Illumination by focused and pulsed beams

[23,26,31,53,76,101,104,123,124,131,136,157,191,215].

2.25. Use of *T*-matrix calculations for testing other theoretical techniques

[19,22,36,72,78,89,98,99,130,132,142,163,164,165,166,168,196,203].

2.26. Use of *T*-matrix calculations for analyzing laboratory and in situ data

[13,24,40,47,51,52,109,127,140,143,170,171,182,184].

2.27. *T*-matrix modeling of scattering properties of mineral aerosols in the terrestrial atmosphere and soil particles

[11,12,17,42,63,65,69,96,99,105,117,140,156,180,190,214].

2.28. *T*-matrix modeling of scattering properties of carbonaceous and soot aerosols and soot-containing aerosol and cloud particles

[30,33–35,58,126,128,141,146,150,151,153,164,165,194,195,196].

2.29. *T*-matrix modeling of scattering properties of cirrus cloud particles

[16,20,21,40,103,133,135,203,216].

2.30. *T*-matrix modeling of scattering properties of hydrometeors and atmospheric radar targets

[8,9,18,27,29,28,32,39,44,45,57,66,68,71,74,77,83,84,89,92,94,106,112,113,114,118,119,120,125,134,137,138,147,159,178,179,189,197,202,207,208,209].

2.31. *T*-matrix modeling of scattering properties of stratospheric and noctilucent cloud particles

[14,56,88,93].

2.32. *T*-matrix modeling of scattering properties of aerosol and cloud particles in planetary atmospheres

[81].

2.33. *T*-matrix modeling of scattering properties of interstellar, interplanetary, cometary, and planetary-ring particles

[82,107,108,177].

2.34. *T*-matrix computations for biomedical applications

[25,109,143,170,205,206,218].

2.35. *T*-matrix computations of anisotropic and aggregation properties of colloids and other disperse media

[52,171,174,217].

### 3. Particles near infinite interfaces

[67,201].

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