

MATHEMATICAL INVESTIGATIONS OF SOME PHYSICAL MODELS



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Thesis submitted in partial fulfillment of the requirements for
Doctor of Philosophy in Mathematical Sciences

Spring 2021

For God and my parents

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Preface and Acknowledgements

The main message of this thesis is:

“ Mechanics is the paradise of the mathematical sciences, because by means of it one comes to the fruits of mathematics.’’ — Leonardo da Vinci¹

¹Source: <https://mathshistory.st-andrews.ac.uk/Biographies/Leonardo/quotations/>

Part I

**Continuum-mechanics-type
equations**

1

Optimal heat transfer

2

Peridynamics

Part II

Coagulation-Fragmentation equations

3

Introduction to Coagulation-Fragmentation equations

4

Well-posedness of a critical Coagulation-Fragmentation equation

5

Metastability of a Coagulation-Fragmentation equation