Summary: In this paper, we provide a complete regularity analysis for the following abstract thermoelastic system with inertial term
\begin{align*}
\rho u_{tt} + l A^\gamma u_{tt} + \sigma A u &= -mA^\alpha \theta, \\
\gamma c \theta_t + m A^\alpha u_t + k A^\beta \theta &= 0,
\end{align*}
where $A$ is a self-adjoint, positive definite operator on a complex Hilbert space $H$ and
\[(\alpha, \beta, \gamma) \in E = \left[0, \frac{\beta + 1}{2}\right] \times [0, 1] \times [0, 1].\]

It is regarded as the second part of [the third author et al., J. Differ. Equations 267, No. 12, 7085–7134 (2019; Zbl 1432.35023)], where the asymptotic stability of this model was investigated. We are able to decompose the region $E$ into three parts where the associated semigroups are analytic, of Gevrey classes of specific order, and non-smoothing, respectively. Moreover, by a detailed spectral analysis, we will show that the orders of Gevrey class are sharp, under proper conditions. We also show that the orders of polynomial stability obtained in [loc. cit.] are optimal.

MSC:

- 35B65 Smoothness and regularity of solutions to PDEs
- 35B40 Asymptotic behavior of solutions to PDEs
- 35K90 Abstract parabolic equations
- 35L90 Abstract hyperbolic equations
- 47D03 Groups and semigroups of linear operators
- 47D06 One-parameter semigroups and linear evolution equations
- 74F05 Thermal effects in solid mechanics
- 93D05 Lyapunov and other classical stabilities (Lagrange, Poisson, $L^p$, $L^q$, etc.) in control theory

Keywords:

- parabolic-hyperbolic systems
- analytic semigroup
- Gevrey class semigroup
- polynomial stability

Full Text: DOI

References:


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