ENERGY DECAY RATE OF THE THERMOELASTIC BRESSE SYSTEM IN THE WHOLE SPACE

Abstract. In this paper, we study the energy decay rate for the thermoelastic Bresse system in the whole space with two different dissipative mechanism, given by two temperatures coupled to the system.

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\begin{align*}
\rho_1 \varphi_{tt} - k (\varphi_x - \psi - l \omega)_x - k_0 l (\omega_x - l \varphi) + l \gamma \theta_1 &= 0 \quad \text{in } \mathbb{R} \times (0, \infty) \\
\rho_2 \psi_{tt} - b \psi_{xx} - k (\varphi_x - \psi - l \omega) + \gamma \theta_{2x} &= 0 \quad \text{in } \mathbb{R} \times (0, \infty) \\
\rho_1 \omega_{tt} - k_0 (\omega_x - l \varphi)_x - kl (\varphi_x - \psi - l \omega) + \gamma \theta_{1x} &= 0 \quad \text{in } \mathbb{R} \times (0, \infty) \\
\theta_{1t} - k_1 \theta_{1xx} + m_1 (\omega_x - l \varphi)_t &= 0 \quad \text{in } \mathbb{R} \times (0, \infty) \\
\theta_{2t} - k_2 \theta_{2xx} + m_2 \psi_{xt} &= 0 \quad \text{in } \mathbb{R} \times (0, \infty) 
\end{align*}
\]

We prove that the decay rate of the solution is very slow when the wave propagation is equal. In fact, we show that the \(L^2\) norm of the solution decay with the rate of \((1 + t)^{-\frac{1}{16}}\) when \(b \rho_1 = k \rho_2\) and \(k = k_0\). We consider also the Bresse system with thermoelasticity of type III where the heat conduction is given by the Green and Naghdi theory and we found that the decay rate is identical. The method we use here is based on a Liapunov functional equivalent to the energy.

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