

Fourth-order Schrödinger type operator with unbounded coefficients in $L^2(\mathbb{R}^N)$

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We study generation results in $L^2(\mathbb{R}^N)$ for the fourth order Schrödinger type operator with unbounded coefficients of the form

$$A = a^2 \Delta^2 + V^2$$

where $a(x) = 1 + |x|^\alpha$ and $V = |x|^\beta$ with $\alpha > 0$ and $\beta > (\alpha - 2)^+$. We obtain that $(-A, D(A))$ generates an analytic strongly continuous semigroup in $L^2(\mathbb{R}^N)$ for $N \geq 5$. Moreover, the maximal domain $D(A)$ can be characterized for $N > 8$ by the weighted Sobolev space

$$D_2(A) = \{u \in H^4(\mathbb{R}^N) : V^2 u, |x|^{2\alpha-h} D^{4-h} u \in L^2(\mathbb{R}^N) \text{ for } h = 0, 1, 2, 3, 4\}.$$