Ground state solutions of Poho\v{z}aev type for Kirchhoff type problems with general convolution nonlinearity and variable potential

Qiongfen Zhang[1], Hai Xie[1], and Yirong Jiang[1]

[1]Guilin University of Technology

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Abstract

This paper is devoted to dealing with the following nonlinear Kirchhoff type problem with general convolution nonlinearity and variable potential: $$\left\{\begin{array}{ll} -({a + b\int_{{\R^3}} | \nabla u{|^2}dx})\Delta u + V(x)u =(I_{\alpha}\ast F(u))f(u),\quad \text{in}\ \ \R^3,\\ u \in H^{1} (\R^{3}), \end{array}\right.$$ where $a>0$, $b\geq0$ are constants, $V\in C^1(\R^3,[0,+\infty))$, $f\in C(\R,\R)$, $F(t)=\int_{0}^{t}f(s)ds$, $I_{\alpha}:\R^{3}\rightarrow \R$ is the Riesz potential, $\alpha\in(0,3)$. By applying some new analytical tricks introduced by [X.H. Tang, S.T. Chen, Adv. Nonlinear Anal. 9 (2020) 413-437], the existence results of ground state solutions of Poho\v{z}aev type for the above Kirchhoff type problem are obtained under some mild assumptions on V and the general "Berestycki-Lions assumptions" on the nonlinearity f. Our results generalize and improve the ones in [P. Chen, X.C. Liu, J. Math. Anal. Appl. 473 (2019) 587-608.] and other related results in the literature.

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