Summary: The aim of this paper is to obtain the existence of solution for the fractional $p$-Laplacian Dirichlet problem with mixed derivatives

$$\iota D_T^\alpha(\|0 D_T^\alpha u(t)\|_0^{p-2} D_T^\alpha u(t)) = f(t, u(t)), \quad t \in [0, T],$$
$$u(0) = u(T) = 0,$$

where $\frac{1}{p} < \alpha < 1$, $1 < p < \infty$ and $f : [0, T] \times \mathbb{R} \to \mathbb{R}$ is a Carathéodory function which satisfies some growth conditions. We obtain the existence of nontrivial solutions by using the direct method in variational methods and mountain pass theorem.

MSC:

26A33 Fractional derivatives and integrals
58E05 Abstract critical point theory (Morse theory, Lyusternik-Shnirel’mann theory, etc.) in infinite-dimensional spaces
65L10 Numerical solution of boundary value problems involving ordinary differential equations

Keywords:

fractional calculus; mixed fractional derivatives; boundary value problem; $p$-Laplacian operator; mountain pass theorem

Full Text: DOI