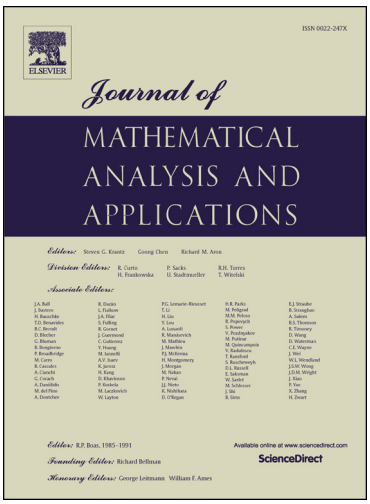
Accepted Manuscript



Positive solutions to nonlinear nonhomogeneous inclusion problems with dependence on the gradient

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PII: S0022-247X(18)30239-7
DOI: https://doi.org/10.1016/j.jmaa.2018.03.033
Reference: YJMAA 22109

To appear in: *Journal of Mathematical Analysis and Applications*

Received date: 30 December 2017

Please cite this article in press as: S. Zeng et al., Positive solutions to nonlinear nonhomogeneous inclusion problems with dependence on the gradient, *J. Math. Anal. Appl.* (2018), https://doi.org/10.1016/j.jmaa.2018.03.033

Positive solutions to nonlinear nonhomogeneous inclusion problems with dependence on the gradient *

Shengda Zeng †, Zhenhai Liu ‡ and Stanisław Migórski §

Abstract. The goal of the paper is to study a generalized elliptic inclusion problem driven by a nonhomogeneous partial differential operator with the Dirichlet boundary condition and a convection multivalued term. An existence theorem for positive solutions of the problem is established by applying the method of subsolution-supersolution, together with truncation and comparison techniques.

Key words. Nonlinear elliptic inclusion, nonhomogeneous partial differential operator, convection multivalued term, subsolution-supersolution, positive solution.

2010 Mathematics Subject Classification. 35J92, 35J25, 35P30.

1 Introduction

In this paper, we are interested in the existence of positive solutions for the following nonlinear nonhomogeneous elliptic inclusion problem with the Dirichlet boundary condition and a convection multivalued term

$$\begin{cases} -\operatorname{div} a(Du(z)) \in F(z, u(z), Du(z)) & \text{in } \Omega, \\ u = 0 & \text{on } \partial\Omega, \end{cases} \tag{1}$$

where $\Omega \subset \mathbb{R}^N$ $(N \geq 2)$ is a bounded domain with C^2-boundary $\partial\Omega$, and D is the gradient operator. Moreover, the nonlinear operator $a\colon \mathbb{R}^N \to \mathbb{R}^N$ is an abstract nonhomogeneous operator, which satisfies certain regularity and growth conditions

* Project supported by the National Science Center of Poland under Maestro Project No. UMO-2012/06/A/ST1/00262, National Science Center of Poland under Preludium Project No. 2017/25/N/ST1/00611, NNSF of China Grant No. 11671101, Special Funds of Guangxi Distinguished Experts Construction Engineering. It is also supported by the International Project co-financed by the Ministry of Science and Higher Education of Republic of Poland under Grant No. 3792/GGPJ/H2020/2017/0.

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