# Extract of agricultural and forestry waste rapeseed cake meal as an environmentally friendly and efficient natural inhibitor

Qian Shi, Shuduan Deng, Xianghong Li*

*College of Materials and Chemical Engineering, Southwest Forestry University, Kunming 650224, P.R. China*

*e-mail address: xianghong-li@163.com*

## Abstract

Considering the concept of green environmental protection, the by-product rapeseed cake meal (RCM) after oil extraction from rapeseed is recycled. A corresponding extract inhibitor (RCME) was prepared via reflux extraction with ethanol solution. The inhibition performance and mechanism of RCME in dichloroacetic acid (DCA) for steel were investigated using gravimetric, electrochemical, and surface characterization techniques. The results indicate that the C, N, and O elements form coordination bonds with Fe atoms upon the introduction of the RCME. The corrosion of the steel sheet surface was significantly suppressed. The maximum inhibition rate of 100 mg $L^{-1}$ RCME can reach 92.3% at 40 ℃. RCME acts as a mixed inhibitor in DCA, primarily affecting the anodic reaction through an “active site blocking effect” mechanism. The introduction of RCME increases the charge transfer resistance and exhibits a single-time constant. Theoretical calculations demonstrate that adenine, L-lysine, and their protonated forms possess active centers that facilitate bonding with Fe atoms. The entire molecule adsorbs onto the Fe(001) surface in a nearly flat orientation, thereby enhancing the contact area of the inhibitor molecule with the CRS surface and leading to excellent inhibition effects. This study offers experimental evidence supporting the use of agricultural and forestry waste in corrosion mitigation applications.

**Keywords:** rapeseed cake meal extract; dichloroacetic acid; agricultural and forestry waste; adsorption; corrosion inhibition

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