

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2024/0180039 A1 SEO et al.

May 30, 2024 (43) **Pub. Date:**

(54) METHOD OF MANUFACTURING MULTILAYER PIEZOELECTRIC ELEMENT INCLUDING INTERNAL ELECTRODES

(71) Applicant: KOREA ELECTRONICS TECHNOLOGY INSTITUTE,

Seongnam-si (KR)

(72) Inventors: Intae SEO, Gwangju-si (KR); Hyung

Won KANG, Seoul (KR); Seung Ho

HAN, Gwacheon-si (KR)

(73) Assignee: KOREA ELECTRONICS

TECHNOLOGY INSTITUTE,

Seongnam-si (KR)

(21) Appl. No.: 18/521,287

(22)Filed: Nov. 28, 2023

(30)Foreign Application Priority Data

(KR) 10-2022-0163185 Nov. 29, 2022

Publication Classification

(51) Int. Cl.

H10N 30/053 (2006.01)C22C 9/06 (2006.01)

H10N 30/067 (2006.01)H10N 30/50 (2006.01)(2006.01)H10N 30/87

(52) U.S. Cl.

CPC H10N 30/053 (2023.02); C22C 9/06 (2013.01); H10N 30/067 (2023.02); H10N 30/50 (2023.02); H10N 30/871 (2023.02); H10N 30/877 (2023.02)

(57)ABSTRACT

Disclosed is a method of manufacturing a multilayer piezoelectric element including internal electrodes, including providing a piezoelectric sheet including ceramic, forming internal electrodes on the piezoelectric sheet to create a piezoelectric sheet with internal electrodes formed thereon, stacking a plurality of piezoelectric sheets with internal electrodes formed thereon to create a piezoelectric stack, sintering the piezoelectric stack to create a sintered piezoelectric stack, and heat-treating the sintered piezoelectric stack in a reducing atmosphere, in which the internal electrodes are formed in an area ratio of 90% or more relative to the area of the piezoelectric sheet, thereby facilitating reduction of the internal electrodes even by reduction heat treatment at a relatively low temperature.

