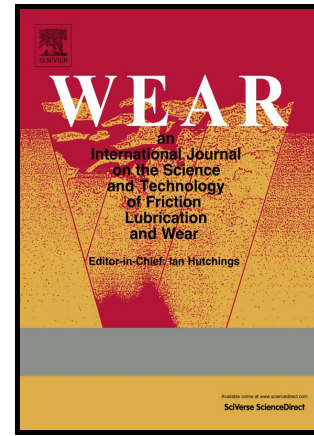


Author's Accepted Manuscript

Investigation of the progressive wear of individual diamond grains in wire used to cut monocrystalline silicon

Ricardo Knoblauch, Denis Boing, Walter Lindolfo Weingaertner, Konrad Wegener, Fredy Kuster, Fabio Antonio Xavier



PII: S0043-1648(18)30349-1
DOI: <https://doi.org/10.1016/j.wear.2018.07.025>
Reference: WEA102473

To appear in: *Wear*

Received date: 18 March 2018
Revised date: 29 July 2018
Accepted date: 29 July 2018

Cite this article as: Ricardo Knoblauch, Denis Boing, Walter Lindolfo Weingaertner, Konrad Wegener, Fredy Kuster and Fabio Antonio Xavier, Investigation of the progressive wear of individual diamond grains in wire used to cut monocrystalline silicon, *Wear*, <https://doi.org/10.1016/j.wear.2018.07.025>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Investigation of the progressive wear of individual diamond grains in wire used to cut monocrystalline silicon

Ricardo Knoblauch^{1*}, Denis Boing², Walter Lindolfo Weingaertner¹, Konrad Wegener³, Fredy Kuster³, Fabio Antonio Xavier¹

¹Department of Mechanical Engineering, Precision Engineering Laboratory, Federal University of Santa Catarina, Florianópolis, SC, Brazil

²Department of Mechanical Engineering, Technology, Innovation and Manufacturing Center, Brusque University Center, Brusque, SC, Brazil

³Institute of Machine Tools and Manufacturing - IWF, ETH, Zurich, Switzerland

*Corresponding author. LMP, Depto. de Eng. Mecânica - CTC, Universidade Federal de Santa Catarina, Trindade, 88040-900, Florianópolis-SC, Brazil.. Tel.: +55-48-99120-5152, ricardo.knoblauch@posgrad.ufsc.br

Abstract

The wear of diamond-coated wire is an important cost driver in the multi-wire sawing of silicon-based photovoltaics. Understanding the different forms of diamond wire wear could help the solar energy industry to be more competitive by reducing wafer costs. In this study, an innovative method was applied to investigate the wear of diamond wires: several diamond grains in a diamond wire loop were tracked during the slicing of monocrystalline silicon. The grains attached to the wire were analyzed by scanning electron microscopy and focus variation microscopy. Based on the observed non-uniformity of wear on the perimeter of the cross-section of the wire, the rotation of the wire on its longitudinal axis was investigated. A new method that promotes wire rotation during cutting was successfully applied. The form and progression of the wear were also investigated by tracking single grains during the cutting process. Observations show the occurrence of nickel layer removal/deformation, micro-chipping of the diamond grains, abrasion wear, and sporadic grain pullout.

Keywords: wear; diamond wire; silicon; wafering.

Download English Version:

<https://daneshyari.com/en/article/7003688>

Download Persian Version:

<https://daneshyari.com/article/7003688>

[Daneshyari.com](https://daneshyari.com)