

1 **Creating value added nano silicon anodes from end-of-life photovoltaic modules:**
2 **recovery, nano structuring, and the impact of ball milling and binder on its**
3 **electrochemical performance**

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17 **How to cite this article:** Nelson A, Mateti S, Chen Y, Sharma N, Han Q, Rahman MM.
18 Creating value added nano silicon anodes from end-of-life photovoltaic modules:
19 recovery, nano structuring, and the impact of ball milling and binder on its
20 electrochemical performance. *Energy Mater* 2024;4:4000xx.

21 <http://dx.doi.org/10.20517/energymater.2024.04>

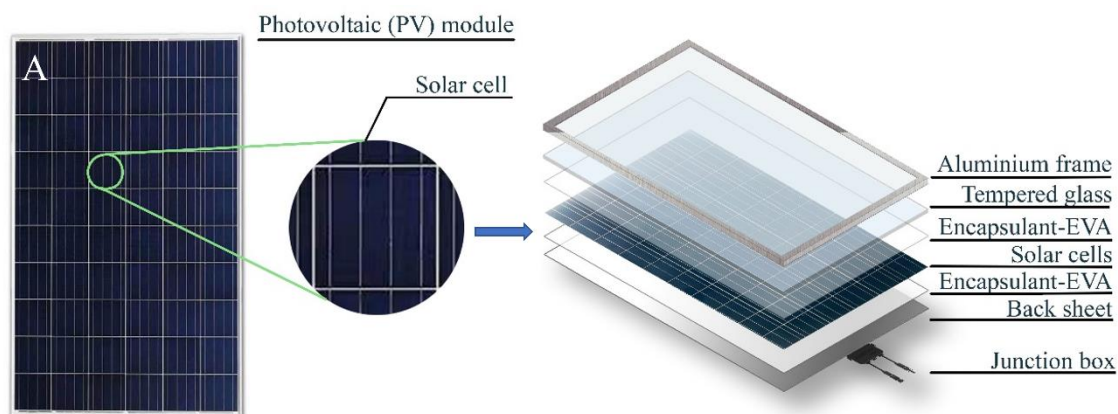
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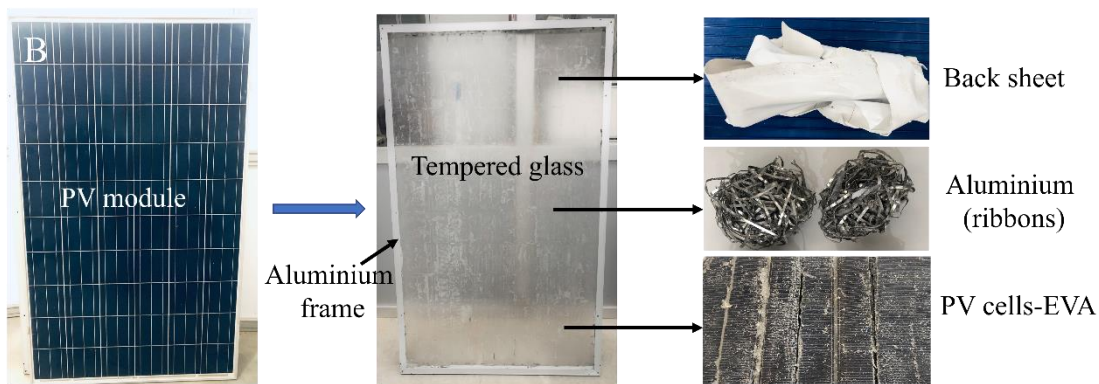
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Typical construction of a PV module



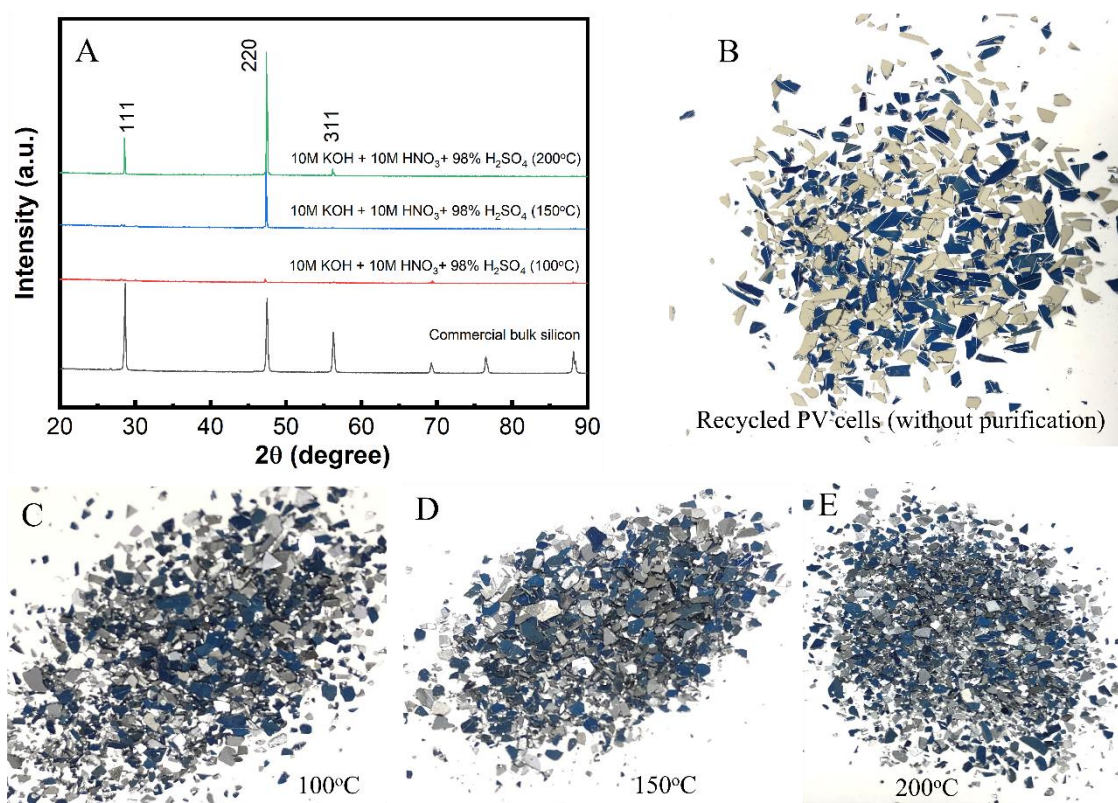
Deconstruction of a PV module



Recovery of PV cells

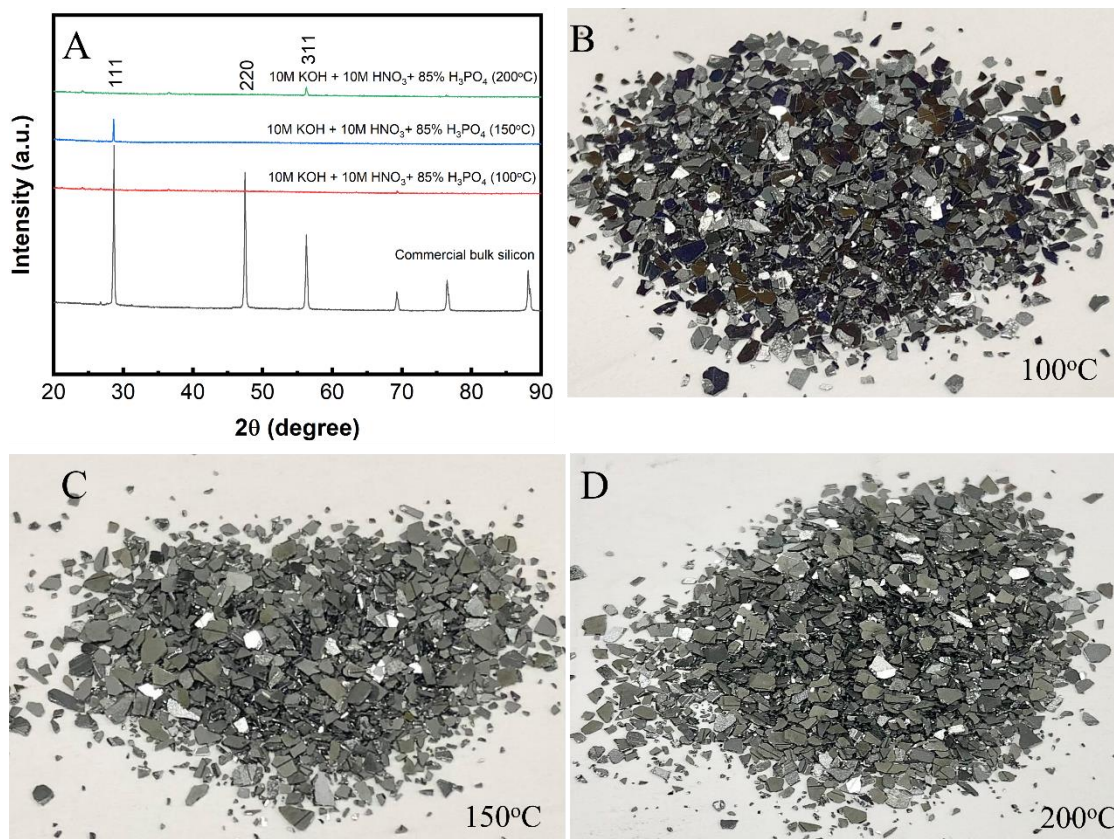
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Supplementary Figure 1. (A) a typical construction of a c-Si PV module, and (B,C) a complete deconstruction process for the recovery of each component.



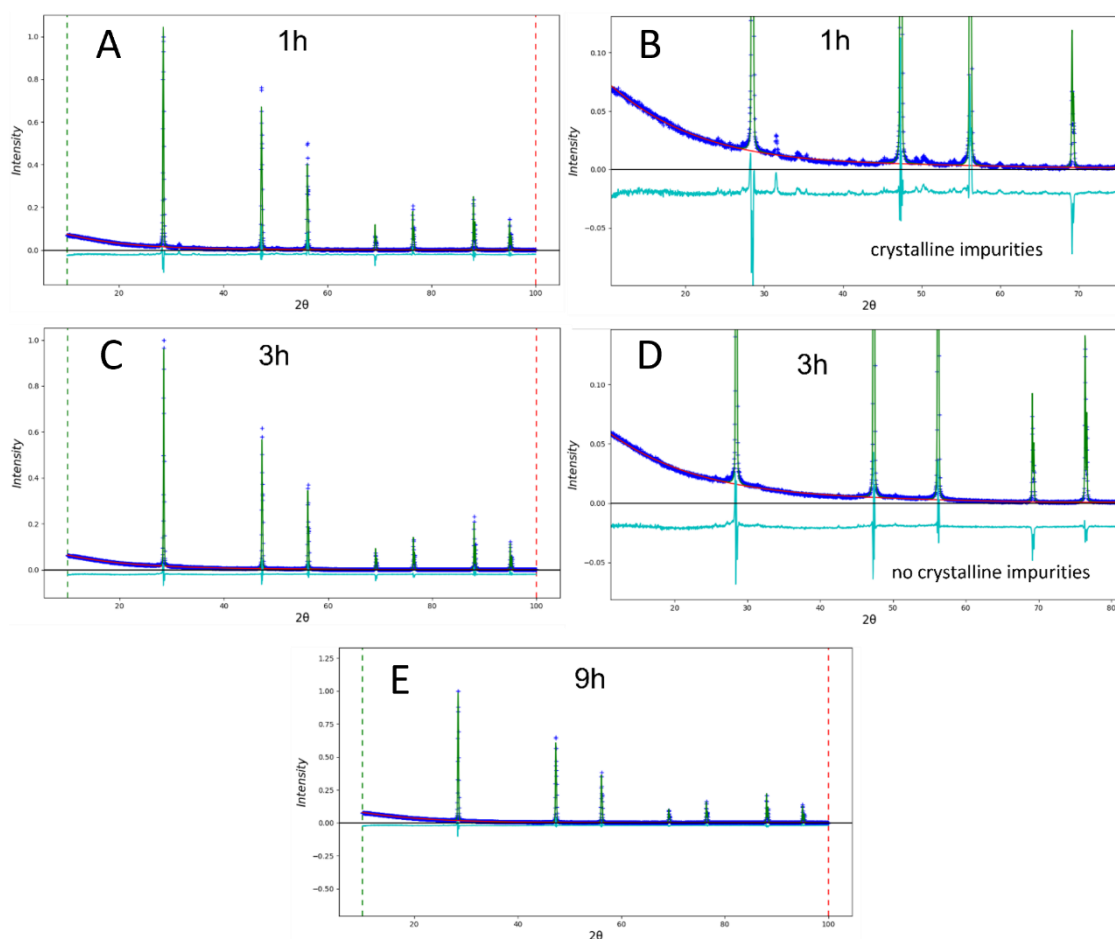
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27 **Supplementary Figure 2.** Purification of recycled PV cells with 10M KOH +10M HNO₃
28 + 98% H₂SO₄ under different temperatures: (A) XRD patterns of the commercial bulk
29 silicon and PV cells treated with 10M KOH +10M HNO₃ + 98% H₂SO₄ at a temperature
30 of 100, 150 and 200°C, respectively, (B) photograph of recycled PV cells (without
31 purification) (front side shows blue in colour which is Si₃N₄), and (C-E) photographs of
32 PV cells treated with 10M KOH +10M HNO₃ + 98% H₂SO₄ at a temperature of 100, 150
33 and 200°C, respectively. All these treated PV cells show blue in colour which is Si₃N₄.



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35 **Supplementary Figure 3.** Purification of recycled PV cells with 10M KOH +10M HNO₃
36 + 85% H₃PO₄ under different temperatures: (A) XRD patterns of the commercial bulk
37 silicon and PV cells treated with 10M KOH +10M HNO₃ + 85% H₃PO₄ at a temperature
38 of 100, 150 and 200°C, respectively, and (B-D) photographs of PV cells treated with 10M
39 KOH +10M HNO₃ + 85% H₃PO₄ at a temperature of 100, 150 and 200°C, respectively.



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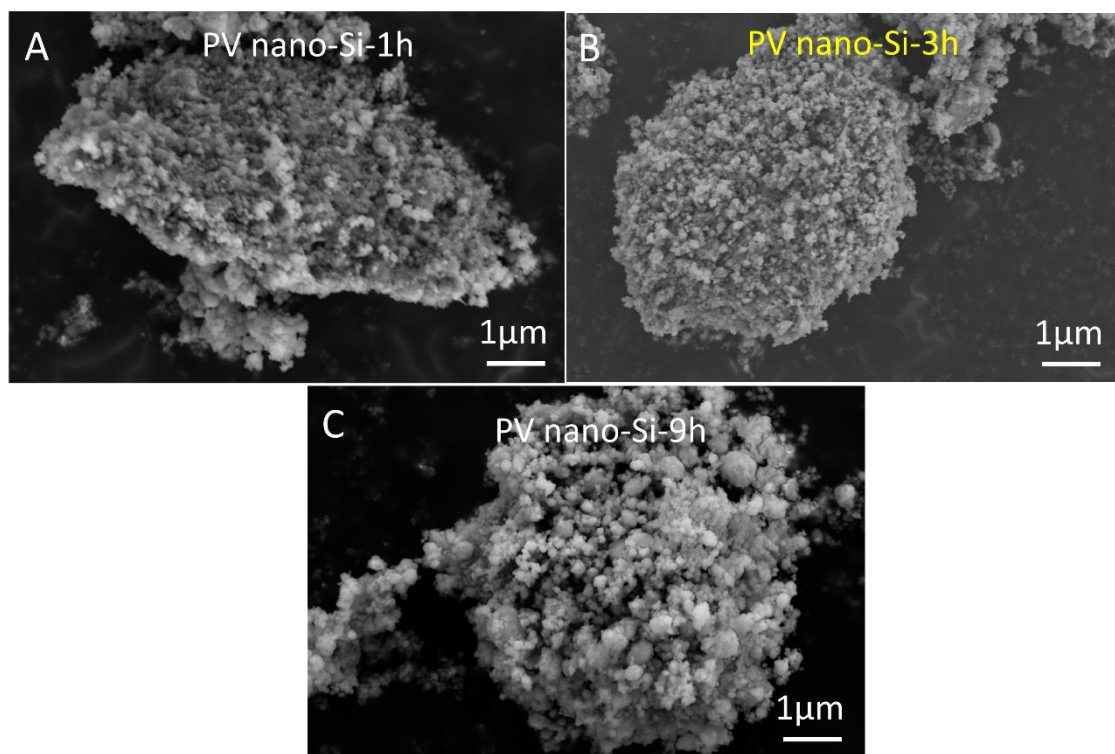
41 **Supplementary Figure 4.** Rietveld refined fits of the Si structural model with XRD data
 42 collected on PV nano silicon with various milling times: (A, B) 1h, (C, D) 3h, and (E) 9h

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44 **Supplementary Table 1.** Structural details derived from Rietveld analysis of the PV
 45 nano silicon samples with different ball milling times.

Sample	a (Å)	100 $U_{iso}(\text{Å}^3)$	x Lorentzian Y term	R_w (%)	Scherrer (nm)
1 h	5.43102(7)	0.49(4)	2.51(22)	14.9	320
3 h	5.43044(5)	0.84(3)	1.03(14)	11.2	770
9 h	5.43086(4)	0.43(3)	1.78(13)	8.9	450

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48 **Supplementary Figure 5.** SEM images of the ball milled PV nano silicon: (A) PV nano-
49 Si-1h, (B) PV nano-Si-3h, and (C) PV nano-Si-9h samples.

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