

1 **Supplementary Information**

2

3 **Hydrogen-Treated CoCrMo Alloy: A Novel Approach to Enhance**

4 **Biocompatibility and Mitigate Inflammation in Orthopedic Implants**

5

6 Yu-Chien Lin <sup>1,2, †</sup>, Chih-Chien Hu <sup>3,4,5 †</sup>, Wai-Ching Liu <sup>6</sup>, Udesh Dhawan <sup>7</sup>, Yu-  
7 Chieh Chen <sup>1</sup>, Yueh-Lien Lee <sup>8</sup>, Hung-Wei Yen <sup>9,\*</sup>, Yi-Jie Kuo <sup>10,11,\*</sup>, Ren-Jei  
8 Chung <sup>1,12,\*</sup>

9

10 <sup>1</sup> Department of Chemical Engineering and Biotechnology, National Taipei  
11 University of Technology, Taipei, Taiwan

12 <sup>2</sup> School of Materials Science and Engineering, Nanyang Technological University,  
13 Singapore

14 <sup>3</sup> Bone and Joint Research Center, Chang Gung Memorial Hospital, Linko, Taiwan

15 <sup>4</sup> Department of Orthopaedic Surgery, Chang Gung Memorial Hospital, Linko,  
16 Taiwan

17 <sup>5</sup> College of Medicine, Chang Gung University, Taoyuan, Taiwan

18 <sup>6</sup> Faculty of Science and Technology, Technological and Higher Education  
19 Institute of Hong Kong, New Territories, Hong Kong, China

20 <sup>7</sup> Centre for the Cellular Microenvironment, University of Glasgow, Glasgow, UK

21 <sup>8</sup> Department of Engineering Science and Ocean Engineering, National Taiwan  
22 University, Taipei, Taiwan

23 <sup>9</sup> Department of Materials Science and Engineering, National Taiwan University,  
24 Taipei, Taiwan

25 <sup>10</sup> Department of Orthopedic Surgery, Wan Fang Hospital, Taipei Medical University,  
26 Taipei, Taiwan

27 <sup>11</sup> Department of Orthopedic Surgery, School of Medicine, College of Medicine,  
28 Taipei Medical University, Taipei, Taiwan

29 <sup>12</sup> High-value Biomaterials Research and Commercialization Center, National Taipei  
30 University of Technology (Taipei Tech), Taipei 10608, Taiwan

31 \* Corresponding authors

32 \* Corresponding Author: Dr. Ren-Jei Chung

33 Email: [rjchung@ntut.edu.tw](mailto:rjchung@ntut.edu.tw); Tel: (886-2) 2771-2171 ext 2547

34 Address: Department of Chemical Engineering and Biotechnology, National Taipei  
35 University of Technology (Taipei Tech), No. 1, Sec. 3, Zhongxiao E. Rd., Taipei  
36 10608 Taiwan

37 Also corresponding to Prof. Hung-Wei Yen ([homeryen@ntu.edu.tw](mailto:homeryen@ntu.edu.tw)) and Dr. Yi-Jie  
38 Kuo ([benkuo5@tmu.edu.tw](mailto:benkuo5@tmu.edu.tw))

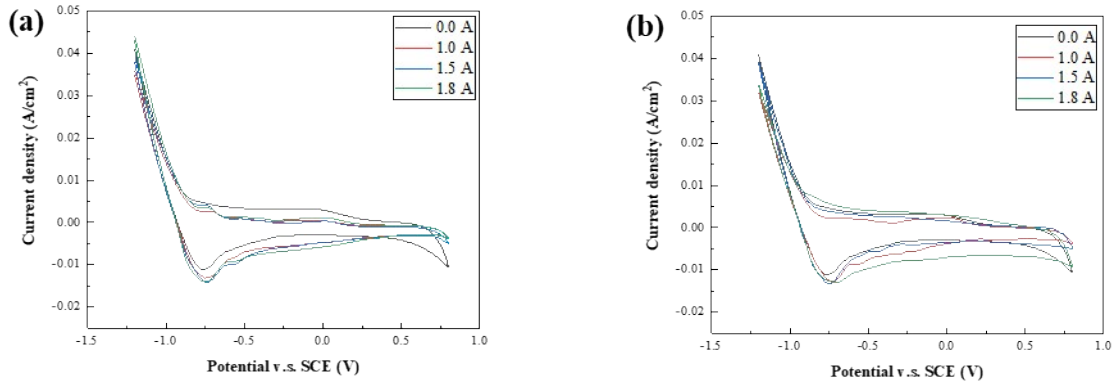
39 † These authors contribute equally to this paper.

40 **1. Results**

41

42 *1.1. Electrochemical hydrogenation condition optimization.*

43

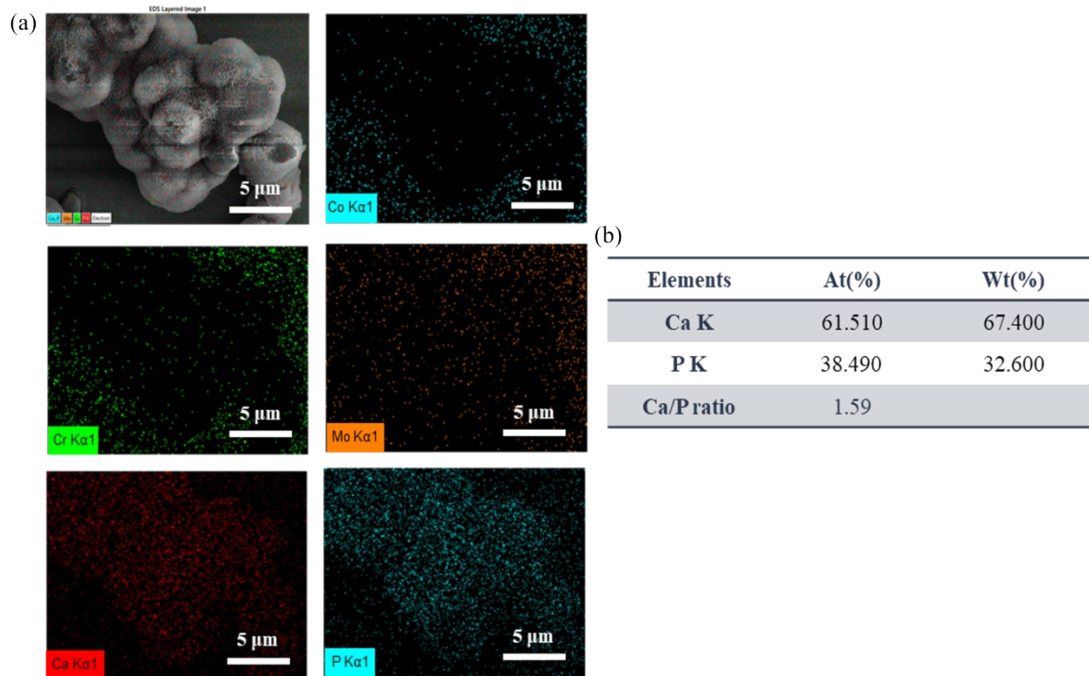


44

45 Fig. S1. Cyclic voltammetry (CV) curves of CoCrMo alloy charging with (a) NaOH +  
46 NaCl + NH<sub>4</sub>SCN and (b) H<sub>2</sub>SO<sub>4</sub> + NH<sub>4</sub>SCN electrolytes in presence of PBS

47

48 *1.2. Element mapping of in vitro bioactivity*



49

50 Fig. S2. (a) Energy-dispersive X-ray spectroscopy (EDX) elemental mapping images  
51 of hydroxyapatite grown on H-CoCrMo alloy immersed in simulated body fluid (SBF)  
52 for 14 days, (b) is the calcium and phosphate ratio in atomic percentage (At%) and  
53 weight percentage (wt%).

54 1.3. Ions release behavior of CoCrMo and H-CoCrMo in an SBF.

55

56 Table S1. shows the ion release behavior of CoCrMo and H-CoCrMo after immersion  
57 in an SBF solution for 21 days to monitor the potential ion release from materials. (ND  
58 indicates non-detection.)

59

<b>Element</b>			
<b>CoCrMo</b>	<b>Co</b>	<b>Cr</b>	<b>Mo</b>
Day 7	ND	ND	ND
Day 14	ND	ND	ND
Day 21	ND	ND	ND
<b>H-CoCrMo</b>	<b>Co</b>	<b>Cr</b>	<b>Mo</b>
Day 7	ND	ND	ND
Day 14	ND	ND	ND
Day 21	ND	ND	ND

60