Supplementary Information (SI) for Nanoscale.
This journal is © The Royal Society of Chemistry 2024

Supporting Information

The assessment of the importance and the role of chromium oxide and chromium carbide for hydrogen generation via hydrolysis of Magnesium

Fei Qin[1], Yue Zhang[1], Kashif Naseem[1,] *, Zhanjun Chen[1], Guoquan Suo[2,] **, Waseem Hayat[3], Syed Hamza Safeer Gardezi[4]

1 School of Materials and Environmental Engineering, Hunan University of Humanities Science and Technology, Loudi 417000, China.

2 School of Materials Science and Engineering, Shaanxi University of Science and Technology, Weiyang, Xian, Shaanxi 710021, PR China

3 School of Environment and Energy; South China University of Technology, Guangzhou 510006, China.

3 Materials Science Laboratory, Department of Physics, Quaid-i-Azam University, Islamabad, 45320, Pakistan.

Corresponding authors:

Kashif Naseem

*Email: kashifsatti010@gmail.com, kashifnaseem@huhst.edu.cn

Guoquan Suo

**Email: suoguoquan@sust.edu.cn

Composites	**Seawater**	**0.5 M $MgCl_2$ Solution**
Mg-1wt%Cr_2O_3	102	245.6
Mg-3wt%Cr_2O_3	567.8	717.6
Mg-5wt%Cr_2O_3	695	754.6
Mg-10wt%Cr_2O_3	798	812
Mg-15wt%Cr_2O_3	775.6	----
Mg-1wt%Cr_3C_2	470	722.5
Mg-3wt%Cr_3C_2	636	767
Mg-5wt%Cr_3C_2	761	790
Mg-10wt%Cr_3C_2	821	831.6
Mg-15wt%Cr_3C_2	782	-----

Hydrogen yield with different wt% contents of Cr_2O_3 and Cr_3C_2 with seawater and 0.5 M $MgCl_2$ solution

Composites	**$MgCl_2$ 0.1 M**	**$MgCl_2$ 0.25 M**	**$MgCl_2$ 0.5 M**
Mg-10wt%Cr_2O_3	772.2	795	812
Mg-10wt%Cr_3C_2	782.6	805	831.6

Hydrogen yield with different molar concentration of $MgCl_2$ after 1 h ball milling

Composites	**0.25 h**	**0.5 h**	**0.75 h**	**1 h**	**3 h**
Mg-10wt%Cr_2O_3	110.6	312.9	588	798	706
Mg-10wt%Cr_3C_2	410.2	620.8	734.1	821	790

Comparison of hydrogen yield of Mg-10wt%Cr_2O_3 and Mg-10wt%Cr_3C_2 with different ball milling 0.25 h-3 h