

ハイエントロピー合金触媒を用いたニトロ基選択的還元反応の開発

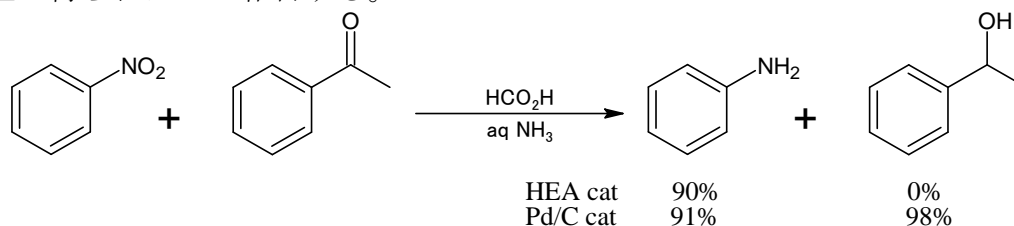
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Chemoselective reduction of nitro-group using high-entropy alloy catalysts (1. Shinshu University, 2. Kochi University of Technology) ○Sota Hiyama,¹ Takeshi Fujita,² Naoki Asao¹

High-entropy alloys (HEA), which are defined as near-equimolar alloys of five or more elements, are attracting ever increasing attention because of the unique properties in comparison with ordinary alloys. While the mechanical properties of HEA have been extensively investigated, its application as a catalyst is still very limited.¹⁻² Recently, Fujita et al. reported that high-entropy alloy with hierarchical porosity was obtained by alkaline treatment of Al-rich 12-element alloy ribbons (Al, Ag, Au, Co, Cu, Fe, Ir, Ni, Pd, Pt, Rh, and Ru).³ Here we report that the resultant HEA exhibits high catalytic properties in the hydrogen-transfer reduction of aromatic nitro compounds. The reaction proceeded smoothly by use of formic acid as a hydrogen source in aqueous ammonia in the presence of HEA as a heterogeneous catalyst, and the desired aniline derivatives were obtained in good to high yields. Even in the presence of other reducible functional groups, such as olefine and carbonyl groups, chemoselective reductions of nitro group were observed.

Keywords: high entropy alloy catalyst, chemoselective reaction, nitro group, hydrogen transfer reduction, Porous structure

ハイエントロピー合金 (HEA) は、5 種類以上の金属がほぼ等モル含まれる合金として定義され、そのユニークな特性からさまざまな用途で注目を集めている。特に HEA の機械的特性は広く研究されているが、触媒としての応用はまだ非常に限られている¹⁻²⁾。最近藤田らは、Al 過剰の 12 元系合金 (Al, Ag, Au, Co, Cu, Fe, Ir, Ni, Pd, Pt, Rh, Ru) をアルカリ処理すると、階層的な多孔性を有するハイエントロピー合金粉末が得られることを報告している³⁾。そこでこの材料の有機合成における触媒的特性を調べるため、ギ酸を用いた水素移動型還元反応における不均一系触媒として用いたところ、芳香族ニトロ化合物からアニリン誘導体が収率よく得られることを見出した。また、他の様々な官能基存在下で同様に反応を行ったところ、ニトロ基を選択的に還元する高い官能基選択性が得られたので報告する。



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