

Products, Pathways, and Kinetics for Catalytic Hydrodenitrogenation of Quinoline in Hydrothermal Condition

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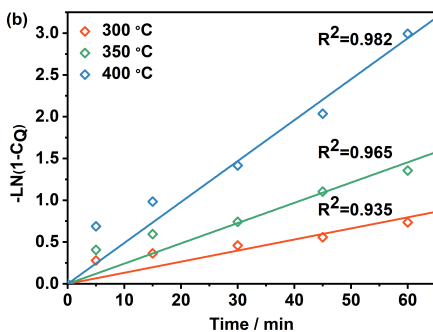
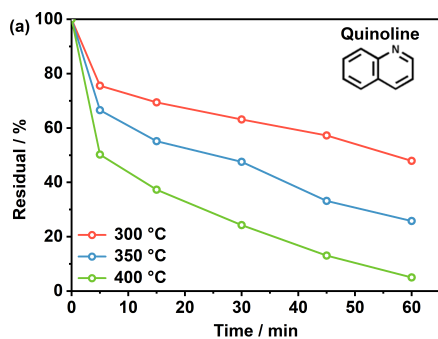
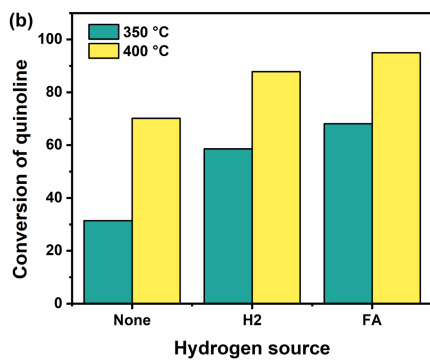
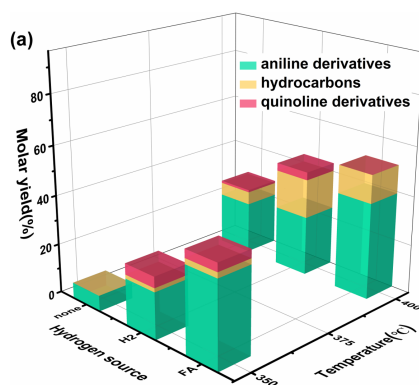
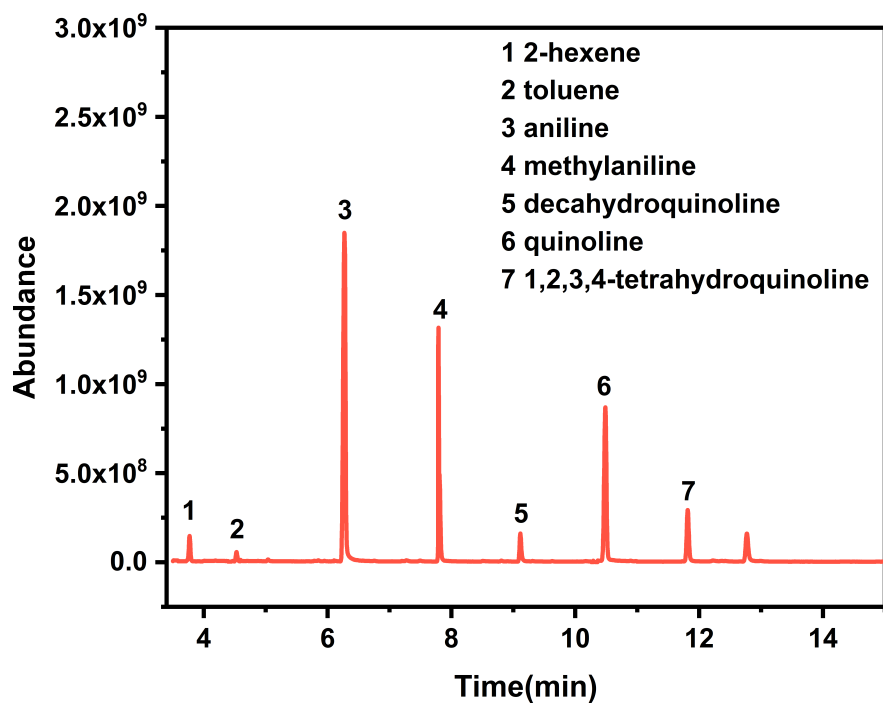
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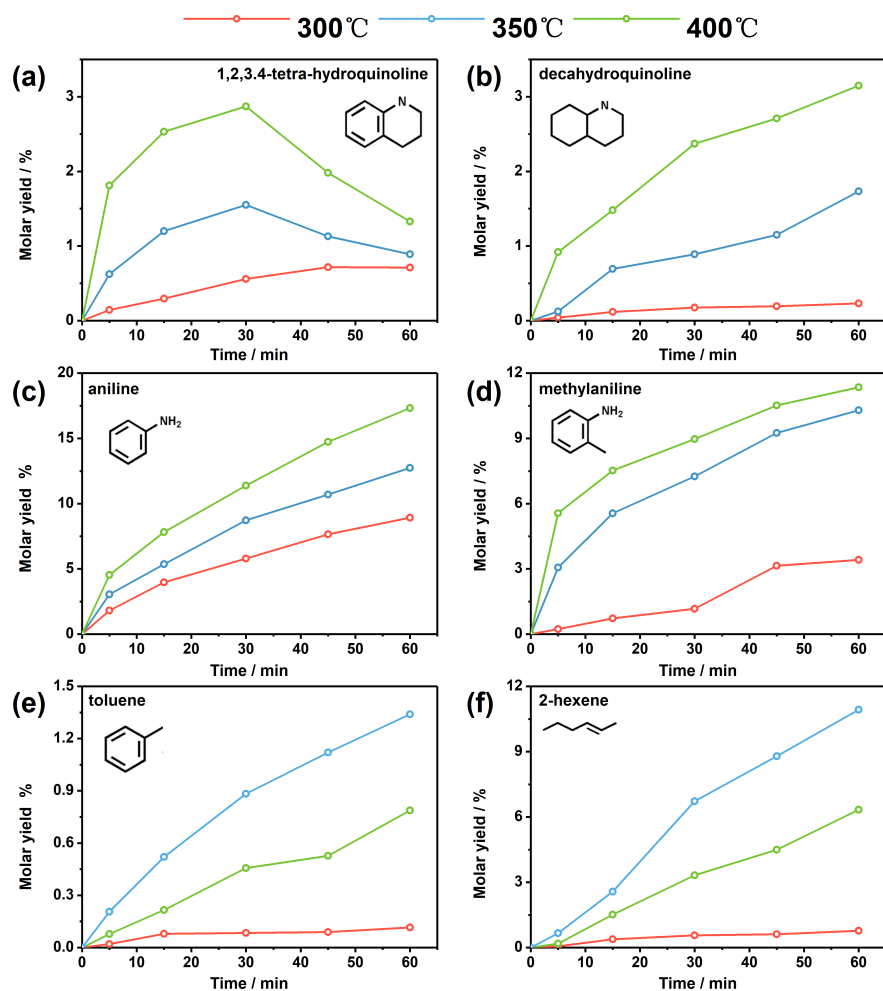
Abstract

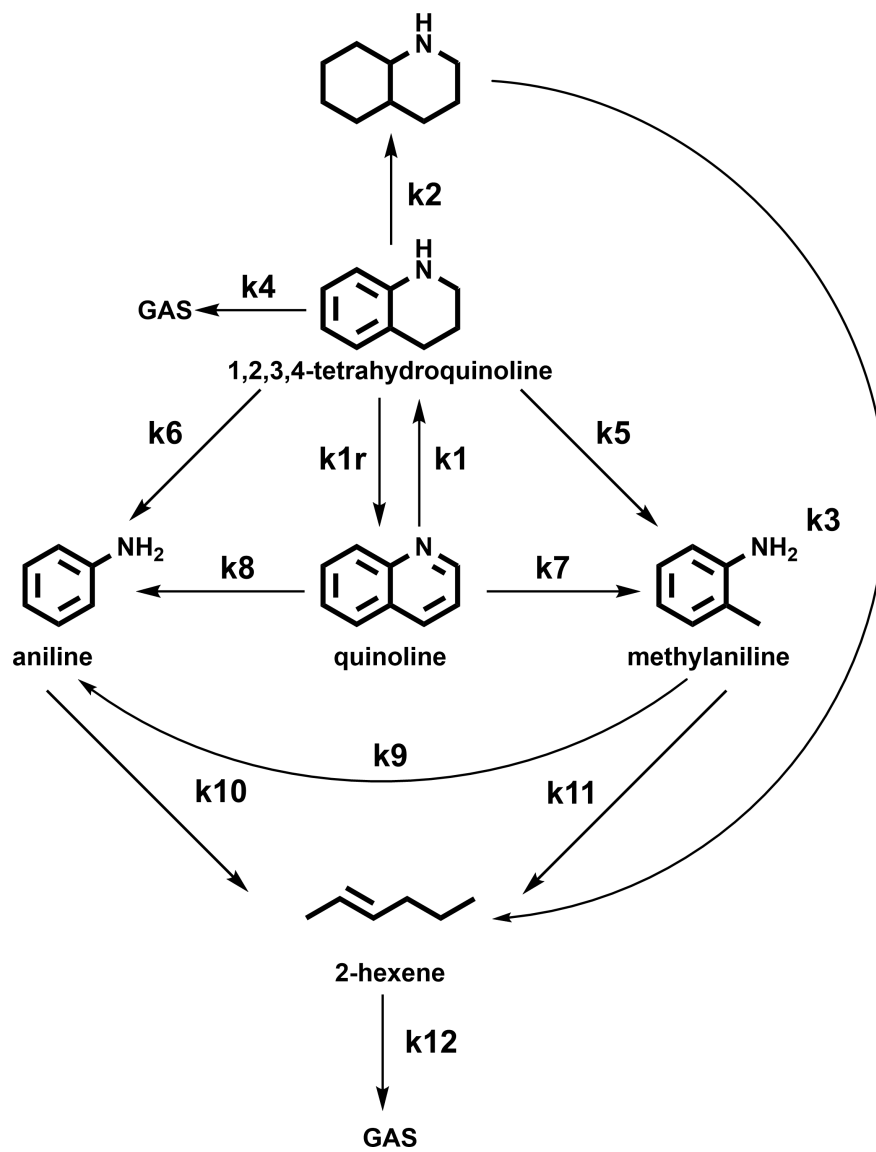
This study focuses on mechanism and kinetics in catalytic hydrodenitrogenation(HDN) of quinoline under hydrothermal conditions (300, 350 and 400°C), in which 30% Ni-Ru/ γ -Al₂O₃ serves as catalyst and formic acid(FA) is used for in-situ H₂ generation. The major products were 1,2,3,4 tetrahydroquinoline, dehydroquinoline, aniline, methyl aniline, 2-hexene, toluene. The quinoline conversion rate followed first-order kinetics, and the activation energy was 41.72 kJ/mol. A kinetic model based on the reaction network of hydrodenitrogenation of quinoline clearly captures all of the trends in the data and fits the temporal variation of all major products. Results reveal that 1,2,3,4-tetrahydroquinoline-dehydroquinoline-2-hexene is the main quinoline HDN route. Reaction rate analysis illustrates deamination is the main denitrogenation pathway. Sensitivity analysis demonstrated that the production of aniline derivatives inhibits yield of quinoline derivatives. TEM characterization indicates that nickel and ruthenium metal are uniformly distributed on the supporter, which was confirmed by XRD and XPS characterization as well.

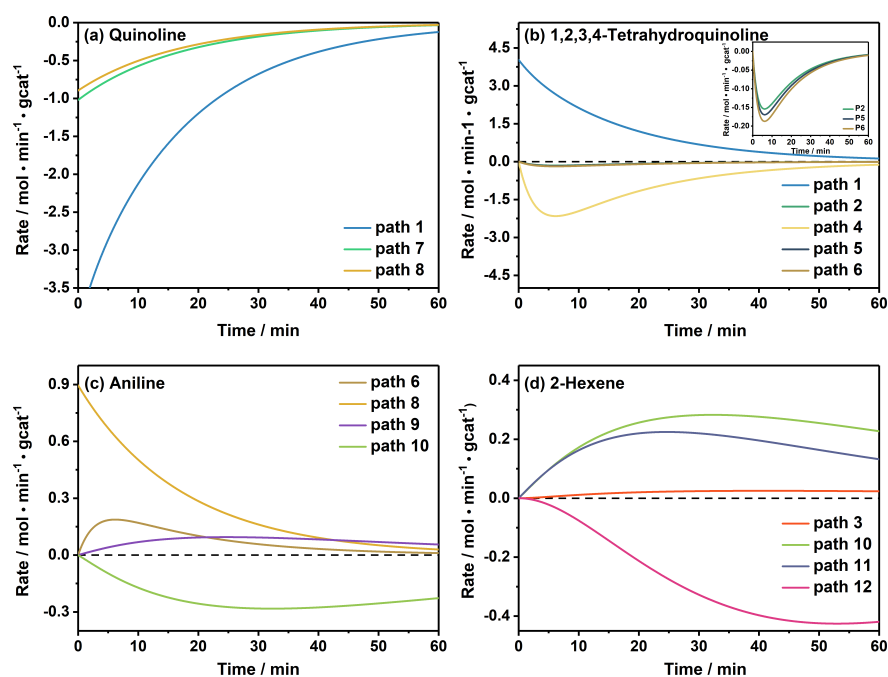
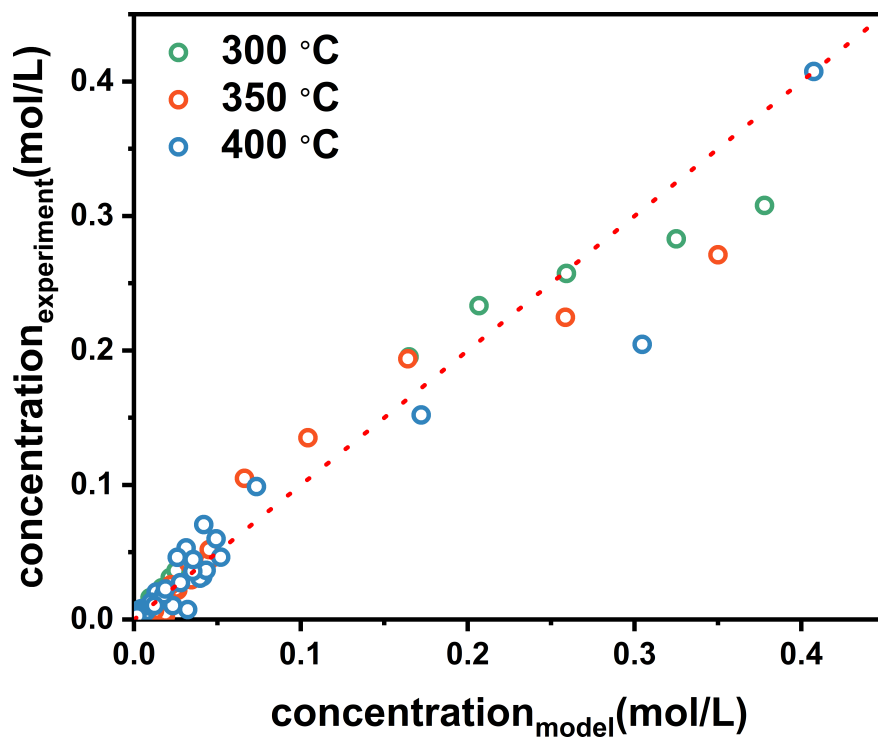
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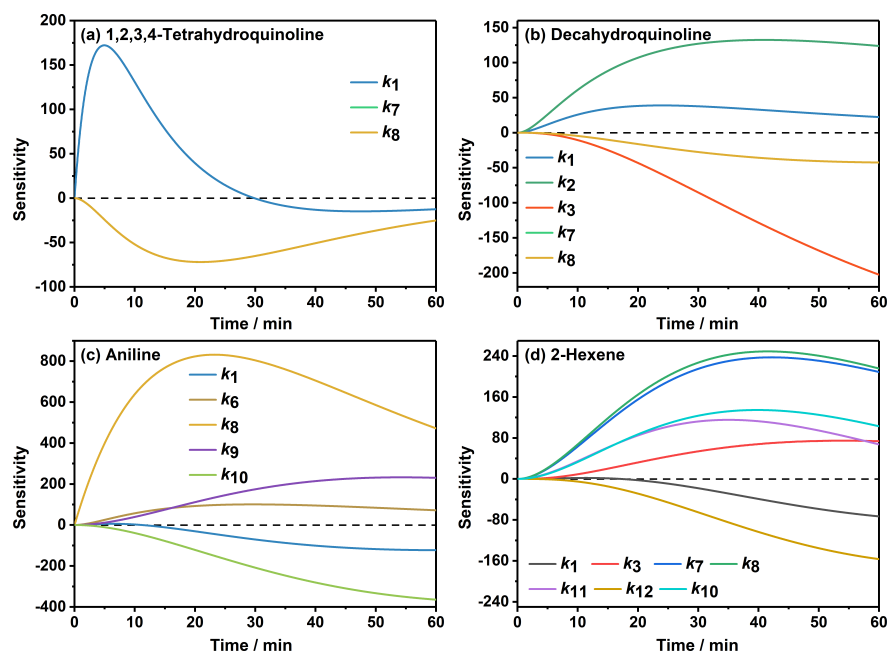
Main Document.docx available at <https://authorea.com/users/734596/articles/711503-products-pathways-and-kinetics-for-catalytic-hydrodenitrogenation-of-quinoline-in-hydrothermal-condition>



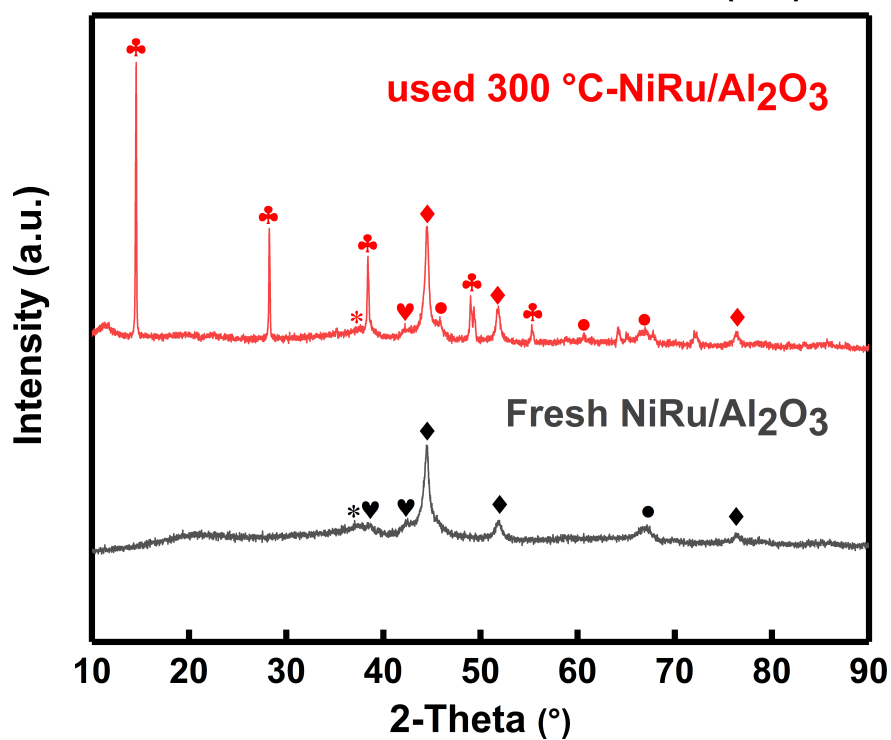


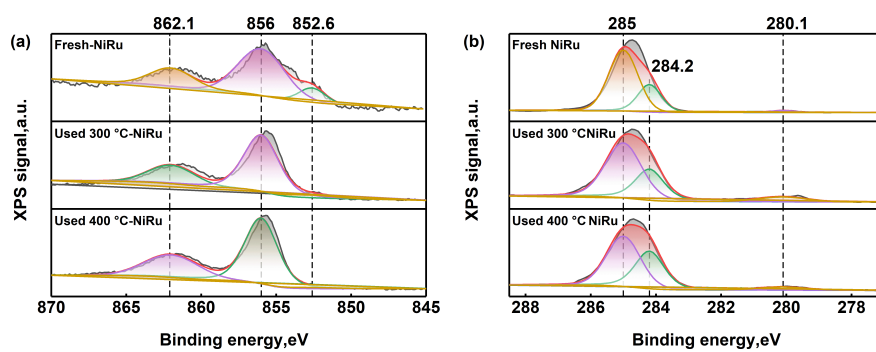
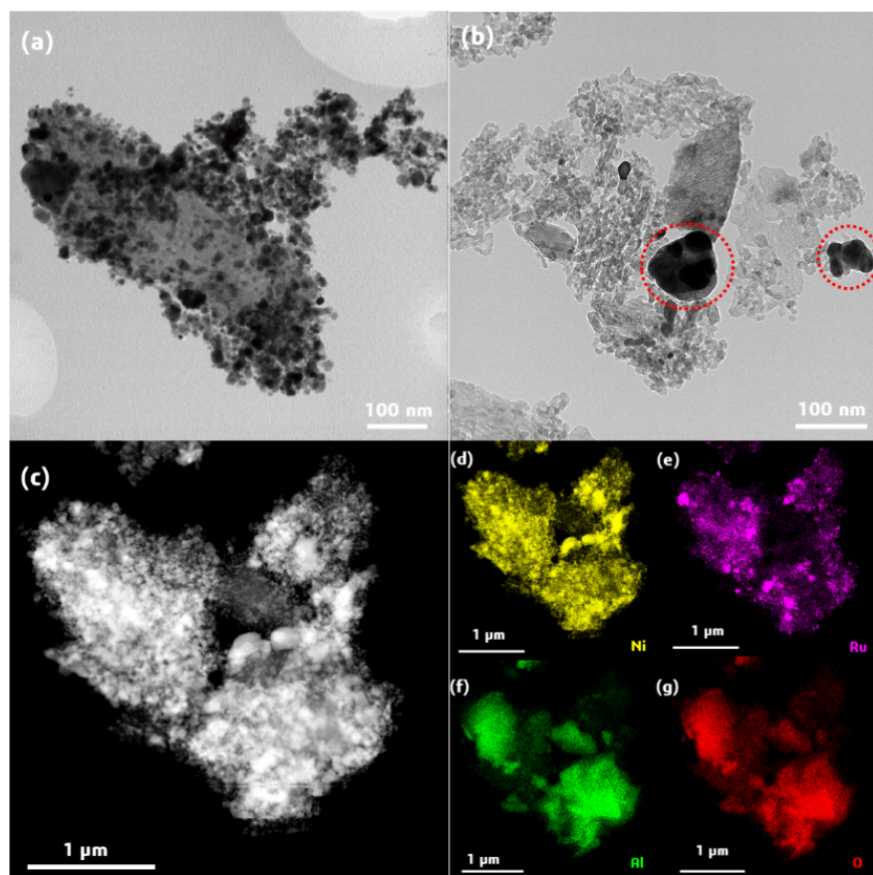


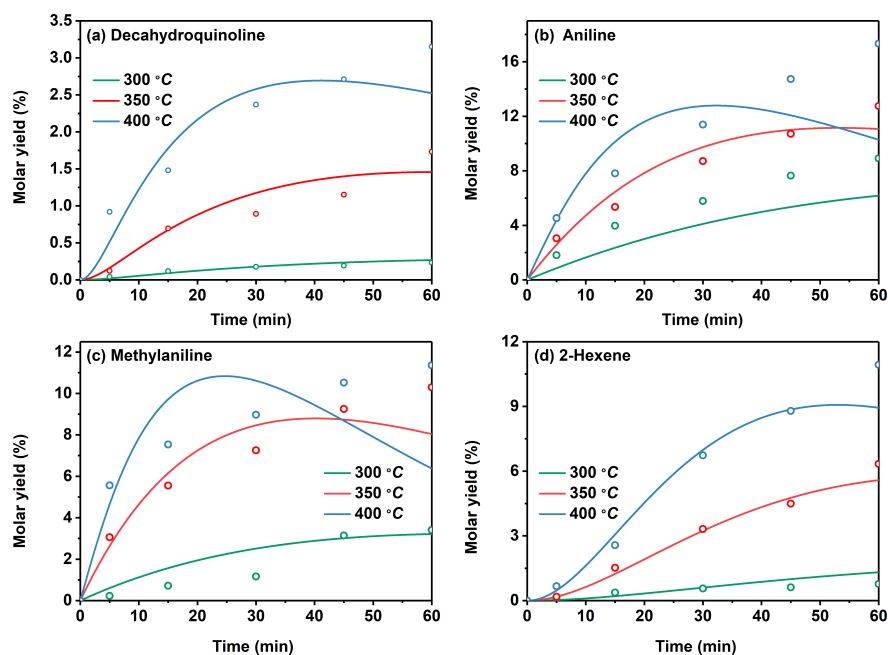




♦ Ni ♥ Ru * NiO • Al₂O₃ ♣ AlO(OH)







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