In order to allow processing of biomass derived fast pyrolysis oils in oil refineries, reduction of the oil’s oxygen content and acid number is required [1]. Deoxygenation can be obtained by direct upgrading of the pyrolysis vapors over solid acid catalysts. A close coupled process operating at temperature and pressure conditions close to those for optimum liquid yields in pyrolysis units offers potential economic advantages over high pressure hydrotreating [2]. To date, the medium pore size ZSM-5 zeolite provides a high aromatic yield and the least amount of coke in upgrading of pyrolysis vapors [3]. However, the coke caused by reactive pyrolysis vapors causes a rapid decay in site accessibility and requires frequent regeneration to recover activity. In addition, irreversible dealumination can be caused by steam from the pyrolysis process, the dehydration reactions during upgrading and the steam produced during oxidative regeneration. We address the reversible deactivation due to coke by introducing an auxiliary mesopores network to improve the accessibility and prolong the zeolite’s active time on stream. In order to reduce the irreversible deactivation, the zeolites acid site strength and density have been balanced with modifications by phosphorous stabilization.