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# **A techno-economic assessment of the potential for combining supercritical water oxidation with ‘in-situ’ hydrothermal synthesis of nanocatalysts using a counter current mixing reactor**

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## **Abstract**

A combined process of supercritical water oxidation (SCWO) and supercritical water hydrothermal synthesis (SCWHS) in a continuous counter current reactor is reported. Acrylic acid was used as a model unsaturated carboxylic acid compound and the effects of the reaction temperature, residence time, oxidant ratio and acrylic acid concentration on chemical oxygen demand (COD) were all investigated. Two different experimental configurations for oxidant delivery were carried out in ‘pre-heated’ and ‘non-preheated’ oxidant configurations. With a stoichiometric excess of 100% oxygen, COD reduction levels of 80% (non-preheated) and 15% (preheated) were achieved with very short residence times. SCWHS was achieved through the addition of small amounts of various soluble metal salts in the cold upflow resulted in nanoparticles forming which increased the reaction rate and hydrothermal

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