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Naproxen-Based Hydrazones as Effective Corrosion Inhibitors for Mild Steel in 1.0 M HCl

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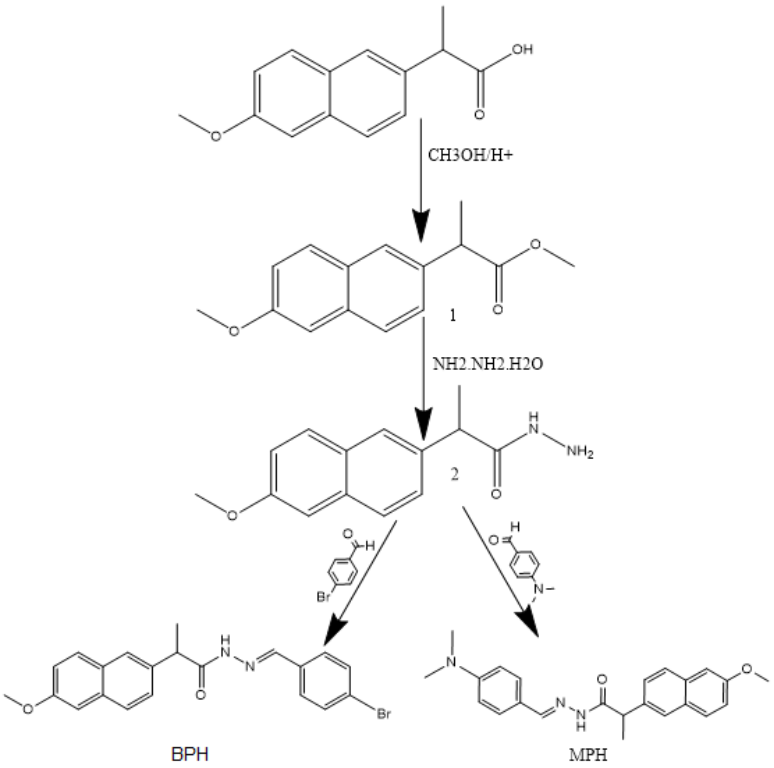
2.1. Synthesis of inhibitor molecules

Synthesis of methyl 2-(6-methoxynaphthalen-2-yl)propanoate (1):A mixture of (11.5gm, 0.05mmol) Naproxen and excess of absolute methanol with a catalytic amount of H_2SO_4 was refluxed for 8 h. The mixture was poured into crushed ice and neutralized with $NaHCO_3$, the precipitated ester was collected and washed with water twice to remove the ions then recrystallized from ethanol to afford the ester as white crystal with m.p = 89–91 °C. IR(KBr): (C=O ester 1739 cm^{-1}), (C–H aliphatic 2975 cm^{-1}),(=C–H aromatic 3061).

Synthesis of 2-(6-methoxynaphthalen-2-yl)propanehydrazide (2):A mixture of Naproxen methyl ester (1) 1 mmol and hydrazine hydrate 5 mmol was refluxed for 20 h. The reaction mixture was cooled and the separated solid was collected and recrystallized from ethanol to obtain the hydrazide with m.p=138–140 °C. IR(KBr): (C=O amide 1635 cm^{-1}), (C–H aliphatic 2931 cm^{-1}),(=C–H aromatic 2999 cm^{-1}).

General procedure for the synthesis of hydrazones (MPH, BPH): A mixture of an equimolar ratio of appropriate aldehyde (0.01 mmol) and naproxen acid hydrazide (0.01 mol) with a catalytic amount of glacial acetic acid as was refluxed in 20 mL of absolute ethanol for 6h. The mixture was cooled, and the solvent was evaporated. The solid precipitate was collected and recrystallized from ethanol to give the hydrazone (Scheme 1).



Scheme 1. General procedure for the synthesis of MPH and BPH.

(E)-N′-(4-(dimethylamino)benzylidene)-2-(6-methoxynaphthalen-2-yl)propanehydrazide (MPH): m.p = 157–160 °C. IR(KBr): (C=O amide 1654 cm^{-1}), (N–H 3236 cm^{-1}),(–C=N 1604 cm^{-1}). ^{1}HNMR(400MHz, DMSO): δ = 1.4(d,3H,CH_3),3.1(s,6H,2CH_3), 3.5(q,1H,C–H), 3.8(s,3H,OCH_3),8.3(s,1H,–CH=N–), 10.5(s,1H,–NH), 7.1–8.0(m,10H, aromatic protons).^{13}C-NMR δ =18(CH_3), 44(C–H aliphatic), 55(OCH_3), 106–156(16aromatic carbons),163(C=N),174(C=O amide).

(E)-N′-(4-bromobenzylidene)-2-(6-methoxynaphthalen-2-yl)propanehydrazide (BPH): m.p = 190–193 °C. IR(KBr): (C=O amide 1664cm^{-1}), (N–H 3228cm^{-1}),(–C=N 1610cm^{-1}).^{1}HNMR(400MHz, DMSO): δ = 1.4(d,3H,CH_3), 3.5(q,1H,C–H), 3.8(s,3H,OCH_3),8.2(s,1H,–CH=N–), 10.3(s,1H,–NH), 7.1–8.0(m,10H, aromatic protons).^{13}C-NMR δ =18(CH_3), 44(C–H aliphatic), 55(OCH_3), 106–155(16aromatic carbons),162(C=N),165 (C=O amide).