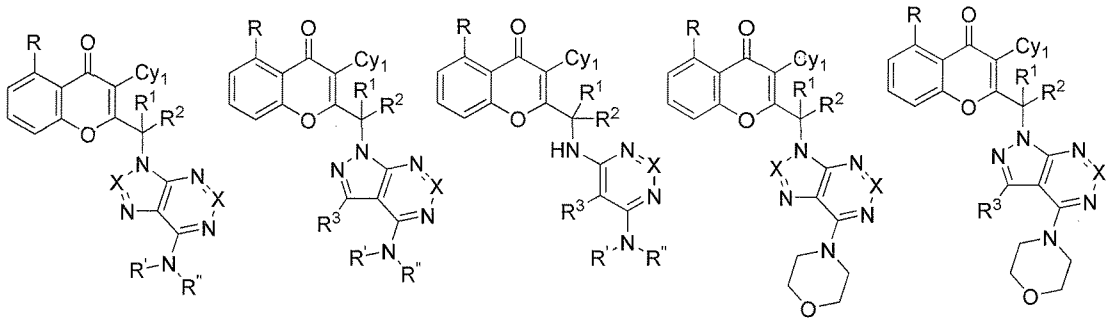


(IA-I) **(IA-II)** **(IA-III)** **(IA-IV)** **(IA-V)**



(IA-Ia) **(IA-IIa)** **(IA-IIIa)** **(IA-Ib)** **(IA-IIb)**

or a tautomer thereof, N-oxide thereof, pharmaceutically acceptable ester thereof, prodrug thereof, or pharmaceutically acceptable salt thereof, wherein:

R is selected from ~~hydrogen,~~ halogen, $-OR^a$, CN, substituted or unsubstituted C_{1-6} alkyl, substituted or unsubstituted C_{2-6} alkenyl, substituted or unsubstituted C_{2-6} alkynyl, substituted or unsubstituted C_{3-8} cycloalkyl, and substituted or unsubstituted heterocyclic group;

R^1 and R^2 may be the same or different and are independently selected from hydrogen, halogen, and substituted or unsubstituted C_{1-6} alkyl, or both R^1 and R^2 directly bound to a common atom, may be joined to form an oxo group (=O) or may be joined to form a substituted or unsubstituted, saturated or unsaturated 3-10 member ring (including the common atom to which R^1 and R^2 are directly bound), which may optionally include one or more heteroatoms which may be the same or different and are selected from O, NR^a and S;

Cy^1 is a monocyclic group selected from substituted or unsubstituted cycloalkyl, substituted or unsubstituted heterocyclic group, substituted or unsubstituted aryl and substituted or unsubstituted heteroaryl; and

X, R^3, R', R'', R^a and q are as defined in any one of claims 1-10.

13. A compound of formula **(IA-VI)**

(R)- 2-(1-(6-(dimethylamino)-9H-purin-9-yl)ethyl)-5-fluoro-3-(3-fluorophenyl)-4H- chromen-4-one ;

2-(1-(9H-purin-6-ylamino)ethyl)-5-fluoro-3-(2-fluorophenyl)-4H-chromen-4-one;

2-(1-(4-amino-3-(4-ethoxy-3-(trifluoromethyl)phenyl)-1H-pyrazolo[3,4-d]pyrimidin-1-yl)ethyl)-5-fluoro-3-(3-fluorophenyl)-4H-chromen-4-one;

2-(1-(4-amino-3-(3-fluoro-4-isopropoxyphenyl)-1H-pyrazolo[3,4-d]pyrimidin-1-yl)propyl)-5-fluoro-3-(3-fluorophenyl)-4H-chromen-4-one;

(S)-5-fluoro-3-(3-fluorophenyl)-2-(1-(2-methoxy-9H-purin-6-ylamino)ethyl)-4H-chromen-4-one;

(R)-5-fluoro-3-(3-fluorophenyl)-2-(1-(2-methoxy-9H-purin-6-ylamino)ethyl)-4H-chromen-4-one;

(S)/(R)- 5-fluoro-2-(1-(2-fluoro-9H-purin-6-ylamino)ethyl)-3-(3-fluoro phenyl)-4H-chromen-4-one;

(S)/(R)-2-(1-(4-amino-3-(3-fluoro-4-isopropoxyphenyl)-1H-pyrazolo[3,4-d] pyrimidin-1-yl)ethyl)-5-methyl-3-phenyl-4H-chromen-4-one;

2-(1-(9H-purin-6-ylamino)ethyl)-5-fluoro-3-o-tolyl-4H-chromen-4-one;

and pharmaceutically acceptable salts thereof.

23. A pharmaceutical composition, comprising a compound of any one of claims 1-22 and a pharmaceutically acceptable carrier.

24. The pharmaceutical composition of claim 23, further comprising one or more additional therapeutic agents selected from anti-cancer agents, anti-inflammatory agents, immunosuppressive agents, steroids, non-steroidal anti-inflammatory agents, antihistamines, analgesics, and mixtures thereof.

25. A use of a compound of any one of claims 1 to 22 in the manufacture of a medicament for the treatment of a disease or disorder that would benefit from inhibiting catalytic activity of a PI3 kinase ~~present in a cell~~, wherein the disease or disorder is cancer, bone disorder, proliferative disease, inflammatory disease or disorder, immune system-related disease, nervous system disease, metabolic disease, respiratory disease, hepatic disease or disorder, renal disease or disorder, thrombosis, or cardiac disease.

~~26. Use of a compound of any one of claims 1-22, in the manufacture of a medicament for the treatment of a disease, disorder, or condition that would benefit from inhibiting catalytic activity of a PI3 kinase wherein the disease, disorder or condition is selected from an immune system-related disease, a disease or disorder involving inflammation, cancer or other proliferative disease, a hepatic disease or disorder, or a renal disease or disorder.~~

~~27. A use of a compound of any one of claims 1 to 22 in the manufacture of a medicament for treating a PI3K associated disease or disorder selected from an immune system related disease, a disease or disorder involving inflammation, cancer or other proliferative disease, a hepatic disease or disorder, or a renal disease or disorder.~~

2628. A use of claim 2527, further comprising at least one other anti-cancer agent, anti-inflammatory agent, immunosuppressive agent, steroid, non-steroidal anti-inflammatory agent, antihistamine, analgesic, or a mixture thereof, to be administered simultaneously of sequentially to a subject in need thereof.

2729. A use of ~~any one of~~ claims 25 orto ~~28~~26, wherein the PI3K associated disease, disorder or condition is selected from inflammation, glomerulonephritis, uveitis, hepatic diseases or disorders, renal diseases or disorders, chronic obstructive pulmonary disease, rheumatoid arthritis, inflammatory bowel disease, vasculitis, dermatitis, osteoarthritis, inflammatory muscle disease, allergic rhinitis, vaginitis, interstitial cystitis, scleroderma, osteoporosis, eczema, allogeneic or xenogeneic transplantation, graft rejection, graft-versus-host disease, lupus erythematosus, pulmonary fibrosis, dermatomyositis, thyroiditis, myasthenia gravis, autoimmune hemolytic anemia, cystic fibrosis, chronic relapsing hepatitis, primary biliary cirrhosis, allergic conjunctivitis, hepatitis, atopic dermatitis, asthm, Sjogren's syndrome, organ transplant rejection, multiple sclerosis, Guillain-Barre, autoimmune uveitis, autoimmune hemolytic anemia, pernicious anemia, autoimmune thrombocytopenia, temporal arteritis, anti-phospholipid syndrome, vasculitides such as Wegener's granulomatosis, Behcet's disease, psoriasis, dermatitis herpetiformis, pemphigus vulgaris, vitiligo, Crohn's disease, colitis, ulcerative colitis, primary biliary cirrhosis, autoimmune hepatitis, Type 1 or immune-mediated diabetes mellitus, Grave's disease. Hashimoto's thyroiditis, autoimmune oophoritis and orchitis, autoimmune disorder of the adrenal gland, systemic lupus erythematosus, polymyositis, dermatomyositis, ankylosing spondylitis, transplant rejection, skin graft rejection, arthritis, bone diseases associated with increased bone resorption;, ileitis, Barrett's syndrome, adult respiratory distress syndrome, chronic obstructive airway disease; corneal dystrophy, trachoma, onchocerciasis, sympathetic ophthalmitis, endophthalmitis; gingivitis, periodontitis; tuberculosis; leprosy; uremic complications, nephrosis; sclerodermatitis, psoriasis, chronic demyelinating diseases of the nervous system, AIDS-related neurodegeneration, Alzheimer's disease, infectious meningitis, encephalomyelitis,

Parkinson's disease, Huntington's disease, amyotrophic lateral sclerosis viral or autoimmune encephalitis; autoimmune disorders, immune-complex vasculitis, systemic lupus and erythematodes; systemic lupus erythematosus (SLE); cardiomyopathy, ischemic heart disease hypercholesterolemia, atherosclerosis, preeclampsia; chronic liver failure, brain and spinal cord trauma, and cancer.

~~30~~28. A use of any one of claims 25 to ~~28~~27, wherein the PI3K associated disease, disorder or condition is selected from hematopoietic tumors of lymphoid lineage, leukemia, acute lymphocytic leukemia, acute lymphoblastic leukemia, B-cell lymphoma, T-cell lymphoma, Hodgkin's lymphoma, non-Hodgkins lymphoma, hairy cell lymphoma and Burkett's lymphoma; hematopoietic tumors of myeloid lineage, acute myelogenous leukemias, chronic myelogenous leukemias, myelodysplastic syndrome, promyelocytic leukemia; carcinoma of the bladder, carcinoma of the breast, carcinoma of the colon, carcinoma of the kidney, carcinoma of the liver, carcinoma of the lung, small cell lung cancer, esophageal cancer, gall bladdercancer, ovarian cancer, pancreatic cancer, stomachcancer, cervical cancer, thyroidcancer, prostatecancer, skincancer, squamous cell carcinoma; tumors of mesenchymal origin, fibrosarcoma, rhabdomyosarcoma; tumors of the central and peripheral nervous system, astrocytoma, neuroblastoma, glioma, schwannoma; melanoma, seminoma, teratocarcinoma, osteosarcoma, xenoderoma pigmentosum, keratoctanthoma, thyroid follicular cancer and Kaposi's sarcoma.

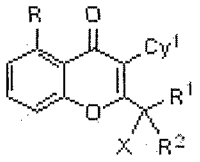
~~31~~29. A use of claim ~~29~~27, wherein the PI3K associated disease, disorder or condition is selected from chronic obstructive pulmonary disease, asthma, rheumatoid arthritis, chronic bronchitis, inflammatory bowel disease, allergic rhinitis, lupus erythematosus and ulcerative colitis.

~~30~~32. A use of claim ~~30~~28, wherein the PI3K associated disease, disorder or condition is selected from hematopoietic tumors of lymphoid lineage, leukemia, acute lymphocytic leukemia, acute lymphoblastic leukemia, B-cell lymphoma, T-cell lymphoma, Hodgkin's lymphoma, non-Hodgkins lymphoma, chronic lymphocytic leukemia, hairy cell lymphoma and Burkett's lymphoma, hematopoietic tumors of myeloid lineage, acute myelogenous leukemias, chronic myelogenous leukemias, myelodysplastic syndrome, promyelocytic leukemia or multiple myelomas which includes smoldering multiple myeloma, nonsecretory myeloma, osteosclerotic myeloma, plasma cell leukemia, solitary plasmacytoma, and extramedullary plasmacytoma;

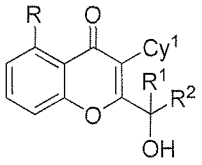
~~33~~31. A use of claim ~~30-28~~ or ~~30~~32, wherein the PI3K associated disease, disorder or condition is selected from Chronic Lymphocytic Leukemia (CLL); Lymphoma Non-Hodgkin

(NHL); Acute Myeloid Leukemia (AML); Multiple Myeloma (MM), Small Lymphocytic Lymphoma (SLL), and Indolent Non-Hodgkin's Lymphoma (I-NHL).

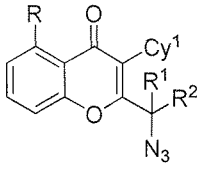
~~34~~32. A compound selected from formulas **(10), (12), (14) and (15)**



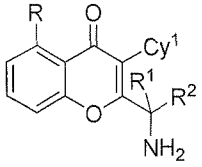
(10)



(12)



(14)

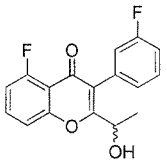


(15)

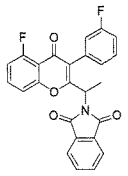
wherein

R, R^1, R^2, and Cy^1 are as defined in claims 1-22, and X is halogen.

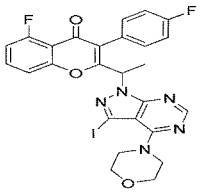
~~35~~33. A compound of claim ~~34~~32 selected from



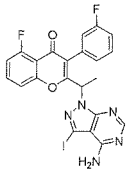
Intermediate 26



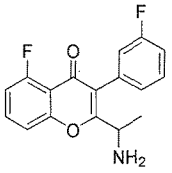
Intermediate 35



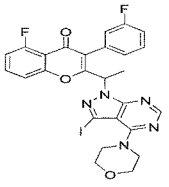
Intermediate 105



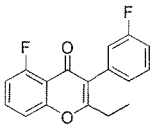
Intermediate 27



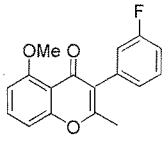
Intermediate 36



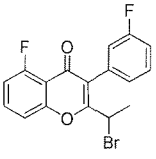
Intermediate 106



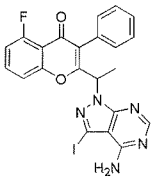
Intermediate 21



Intermediate 9



Intermediate 22



Intermediate 108

~~36~~34. 2-(1-(4-amino-3-(3-fluoro-4-isopropoxyphenyl)-1H-pyrazolo[3,4-d]pyrimidin-1-yl) ethyl)-5-fluoro-3-(3-fluorophenyl)-4H-chromen-4-one and pharmaceutically acceptable salt thereof.

~~37~~35. (+)-2-(1-(4-amino-3-(3-fluoro-4-isopropoxyphenyl)-1H-pyrazolo[3,4-d]pyrimidin-1-yl) ethyl)-5-fluoro-3-(3-fluorophenyl)-4H-chromen-4-one, or a pharmaceutically acceptable salt thereof.

~~38~~36. (-)-2-(1-(4-amino-3-(3-fluoro-4-isopropoxyphenyl)-1H-pyrazolo[3,4-d]pyrimidin-1-yl) ethyl)-5-fluoro-3-(3-fluorophenyl)-4H-chromen-4-one, or a pharmaceutically acceptable salt thereof.